National Library
of Canada

Acquisitions and
Bibliographic Services Branch

395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale
du Canada

Direction des acquisitions et
des services bibliographiques

395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file   Votre référence

Our file   Notre référence

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30, and subsequent amendments.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30, et ses amendements subséquents.

Canada

UNIVERSITY OF ALBERTA

A FIELD STUDY
VALIDATING A DATA DISPLAY PROCEDURE TO FACILITATE FUNCTIONAL ASSESSMENT

BY

© FRANK JAMES SYMONS

A THESIS SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND
RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE DEGREE OF

MASTER OF EDUCATION
DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

FALL 1992

National Library of Canada
Bibliothèque nationale du Canada

Canadian Theses Service
Service des thèses canadiennes

Ottawa, Canada
K1A 0N4

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-315-77227-1

Canada

UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR:	Frank James Symons
TITLE OF THESIS:	A Field Study Validating a Data Display Procedure to Facilitate Functional Assessment
DEGREE:	Master of Education

YEAR THIS DEGREE GRANTED: Fall, 1992

Permission is hereby granted to the University of Alberta Library to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly, or scientific research purposes only.

The author reserves all other publication and other rights in association with the copyright in the thesis, and except as hereinbefore provided, neither the thesis nor any substantial portion thereof may be printed of otherwise reproduced in any material form whatever without the author's prior written permission.

Frank Symons

11249 - University Avenue
Edmonton, Alberta, Canada
T6G 1Y5

Date: July 29, 1992

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled A FIELD STUDY VALIDATING A DATA DISPLAY PROCEDURE TO FACILITATE FUNCTIONAL ASSESSMENT submitted by FRANK JAMES SYMONS in partial fulfillment of the requirements for the degree of MASTER OF EDUCATION in EDUCATIONAL PSYCHOLOGY.

Dr. L. M. McDonald

gerard kysela
Dr. G. M. Kysela

Dr. W. F. Epling

DATE July 23/92

To my Mother

Georgina

who set me on this road many years ago

Abstract

A field study was conducted to validate the scatter plot method (Touchette, MacDonald, & Langer, 1985) for displaying behavioral data when conducting a functional assessment of problem behavior. Using an AB design, direct observational data, displayed via the scatter plot, were evaluated across four behavior disordered elementary school students. Hypotheses regarding the antecedent conditions setting the occasion for the occurrence of problem behaviors were generated. The independent variable consisted of program changes to activities or schedules that were associated with occurrences of aberrant behavior. It was anticipated that curricular or schedule changes, based on the hypotheses, would produce positive and durable treatment gains for the students. Visual analysis of the scatter plots for three of the four students suggested that the scatter plot assessment led to program changes that reduced target problem behavior. Results of a questionnaire administered to the teaching staff involved in the present study supported it's use within the context of an elementary, special education classroom. Suggestions are made regarding future research concerning the scatter plot, antecedent and functional interventions, field studies, and experimental analyses.

ACKNOWLEDGEMENTS

This work was the product of many. Gratitude, appreciation and admiration in particular are extended to the following:

My advisor, Dr. Linda McDonald for her enthusiasm and encouragement (and the free golf game).

Dr. Gerry Kysela for his variable interval schedule of reinforcement.

Dr. Frank Epling for helping me understand the complicated relation between basic and applied research.

Dr. David Pierce for his belief that applied research, although difficult, is important.

Judy Cameron for her encouragement and humour.

Dr. Rod Beattie for his inspiration and ability to put things in perspective.

The teaching staff: Judy, Bobbie, Brian, and Ron. Without their dedication, enthusiasm, and tireless efforts this study would not have been possible,

Students 1, 2, 3, and 4, in each of whom lives an enduring spirit.

The Edmonton Catholic School Board for giving me the opportunity to conduct research in their classrooms.

My roommates, Alvin and Mike, for putting up with me.

Marya Owen for her warmth, humour, and the many hours of listening to the rantings and ravings of the researcher.

TABLE OF CONTENTS

Chapter Page

I. INTRODUCTION 1

II. REVIEW OF THE LITERATURE 6

- Behavior Analysis 6
  - Operant Variables 6
  - Stimulus Control/Setting Events 9
  - Antecedent Interventions 12
- Functional Assessment 16
- Scatter Plot 20
- Antecedent Interventions and Students with Behavior Disorders 23
- Purpose of the Study 26

III. METHODS AND PROCEDURES 28

- Participants 28
- Setting and Schedules 30
- Dependent Measures 31
- Data Collection 34
- Inter–Observor Reliability 37
- Independent Variable 38
- Design 39
- Social Validity 41

IV. RESULTS 42

- Reliability 42
- Visual Analysis of the Scatter Plot Data 43
  - Student One 43
  - Student Two 50
  - Student Three 54
  - Student Four 62
- Summary of Staff Responses to Scatter Plot Questionnaire 66

V. DISCUSSION.. 69

Descriptive Analysis of the Data.. 70

Limitations..77

Implications..82

Future Research and Concluding Statement............................... 85

REFERENCES... 88

APPENDIX I Scatter Plot..97

APPENDIX II Classroom 1 Daily Schedule..................................99

APPENDIX III Classroom 2 Daily Schedule.................................. 101

APPENDIX IV Raw Data Collection Sheets..................................103

APPENDIX V Questionnaire..106

APPENDIX VI Consent Form...110

LIST OF TABLES

TABLE 1. Student Characteristics........29

TABLE 2. Definitions of Students' Problem Behavior........32

TABLE 3. Functional Assessment Guidelines........40

TABLE 4. Salient Antecedent Events for Student 1........48

TABLE 5. Salient Antecedent Events for Student 2........55

TABLE 6. Salient Antecedent Events for Student 3........60

LIST OF FIGURES

FIGURE 1. Sample scatter plot with hypothetical data.......36
FIGURE 2. Scatter Plot for Student 1.......44
FIGURE 3. Line Graph for Student 1.......45
FIGURE 4. Line Graph for Student 1.......46
FIGURE 5. Scatter Plot for Student 2.......51
FIGURE 6. Line Graph for Student 2.......52
FIGURE 7. Line Graph for Student 2.......53
FIGURE 8. Scatter Plot for Student 3.......57
FIGURE 9. Line Graph for Student 3.......58
FIGURE 10. Line Graph for Student 3.......59
FIGURE 11. Scatter Plot for Student 4.......64
FIGURE 12. Line Graph for Student 4.......65
FIGURE 13. Bar graph of % of target intervals containing occurences of problem behavior.......67

CHAPTER I

INTRODUCTION

The experimental analysis of behavior has successfully demonstrated the importance of arranging and delivering consequences to control animal behavior (Skinner, 1953). Skinner also advanced the possibility of a science of human behavior. This science would extend basic principles discovered in the laboratory to humans (Epling & Pierce, 1986). The mechanisms studied in the laboratory could conceivably be studied and applied to complex human behaviors and environments.

The application of the experimental analysis of behavior to human problems of social importance is termed applied behavior analysis. Research in applied behavior analysis is focussed on the management, understanding, and improvement of problem behavior (Baer, Wolf, & Risley, 1968, 1987; Cipani, 1989). While both basic and applied researchers ask what variables control behavior, applied researchers also concentrate on those variables which may effectively improve the behavior under study. The study of problem behavior is often conducted in the individual's "natural" environment rather than a laboratory setting. By examining environmental determinants of problem behavior under natural conditions, the ecological validity of basic behavior principles is tested (Epling & Pierce, 1986). Direct observation is the standard method chosen by applied behavior analysts to evaluate the relation between the environment and problem behavior. A subject's target behaviors are observed and recorded by observer(s) under the control of a written behavior code (Baer et al., 1968, 1987). Using this approach, applied behavior analyses have demonstrated success in many settings with many behaviors including adult disorders (Haynes, 1989), severe developmental disabilities (Cipani, 1989; Danforth & Drabman, 1989), and childhood disorders in schools (Abramowitz & O'Leary, 1990; Gaylord-Ross, Haring, Breen, & Pitts-Conway, 1984; Rhode, Morgan, & Young, 1983).

In school settings, applied behavior analysis emphasizes instructional and functional interventions wherein environmental factors are considered with little reliance on inferred processes or hypothetical constructs operating within the student. By examining environmental factors, a direct link can be established between assessment data and educational/behavioral intervention programs for special needs students. The environment-behavior assessment includes a student specific intervention plan, assessment of the link between environmental conditions and the student's behavior, and continuous assessment with decisions and modifications made as required (Shapiro & Kratochwill, 1988). A behavioral assessment of a student's disruptive behavior, for example, essentially asks under what conditions does the disruptive behavior occur or not occur. Specific answers to this general question can guide interventions and program changes for students in special education settings.

The majority of applied behavioral studies focus on the consequences of behavior and contingency management. For example, token economies have been designed to control student behavior in regular and special education classrooms (Kazdin, 1982; Williams, Williams, & McLaughlin, 1989). Conditioned, generalised reinforcers are made available to students contingent on the presence of positive behaviors. Some researchers have argued that antecedent manipulations, which proactively structure settings to set the occasion for positive behaviors, may be more beneficial to students than the rigid control required by contingency management systems (McNaughton, 1980; Wheldall, 1981). For example, Dyer, Dunlap, and Winterling (1990) have shown that choice of activities within a curriculum or daily schedule for 3 students with severe handicaps in a residential treatment centre effectively reduced levels of problem behavior (aggression, self-injury). Thus, in some classrooms, schedules can set the occasion for positive behaviors or problem behaviors. It is suggested, then, that individualized classroom schedules are stimuli controlling student behavior.

However, problems in the design and development of individual or classroom schedules are evident (Brown, 1991). Very often, educated guesses or poorly conceived measurement systems lead to improper implementation for developmentally delayed or behaviorally disordered students. For example, the student may misbehave because an inadequate assessment leads to a sequence of tasks assigned which are not part of the person's repertoire. At times it is also difficult to ascertain a clear link between assessment and subsequent intervention (e.g., Kratochwill & Shapiro, 1988). The practice of approaching aberrant behavior with a preplanned treatment regimen is one factor weakening the link between assessment and intervention. If, for example, a referred student displays numerous tantrums a behaviorally oriented practioner may utilize readily available well established techniques to reduce behavior. While such an approach may "work" in the short term, it is likely to fail in the long run because it ignores the "reasons" or causes of the misbehavior (Luiselli, 1991). It is technologically rather than analytically oriented. On the other hand, functional approaches to problem behavior are analytically orientated.

Functional approaches may be essential to (a) keep the link between assessment and intervention strong and (b) reduce the need for educated guessing (Kratochwill & Shapiro, 1988). The objective of a functional analysis is to identify stimuli that set the occasion for or maintain problem behaviors. Specifically, functional or experimental analyses empirically examine the relation between behavior and environment by manipulating controlling variables. On the other hand, functional assessments identify antecedent or consequent events setting the occasion for or maintaining a target behavior but do not discretely test hypotheses by removing the subject from his or her natural context to test controlling variables. Instead naturalistic observation is used (Lennox & Miltenberger, 1989). In both cases (analysis and assessment), an understanding of the controlling or causal variables is being sought.

Touchette et al. (1985) have proposed a scatter plot technique for displaying observational data to facilitate functional assessments and guide subsequent interventions. Daily behavioral observations are plotted on a grid with time of day located on the ordinate and days of the week along the abscissa. The graphing method differentiated between low, medium, and high frequencies of problem behavior within specified time intervals appropriate to the individual's schedule. Correlations are noted between time of recording and high rates of problem behavior. The scatter plot is then visually analyzed for temporal patterns in identified problem behaviors.

While the procedure produced only a "rough representation of rate" and did not identify any discrete controlling variables, the method was shown to be effective for designing programs to reduce high rates of self-injurious and aggressive behavior in adolescents and adults with autism. Touchette et al. (1985) suggested that the array of possible controlling stimuli may be too broad to test in uncontrolled applied settings; thus, broad based, easy to use, functional assessment methods may play an important role in initial curriculum planning for students considered emotionally disturbed or behavior disordered. While the practitioner cannot conclude that a causal relationship exists between the behavior and recorded events (because no variables are actually manipulated), the data may reflect a correlational relationship leading to hypotheses about controlling variables (Lennox & Miltenberger, 1989).

Unfortunately, there are relatively few published studies reporting the use of functionally based assessment strategies prior to treatment selection (Deitz, 1978; Lennox & Miltenberger, 1989). The published studies that do exist are largely derivative of Carr's (1977) review wherein challenging behavior is viewed as an operant to be understood by investigating the relationships between the behavior and its antecedents and consequences. Carr suggested that the most common functions of challenging behavior were attention, escape, tangible reinforcement, and sensory stimulation. Subsequent applied behavior analysis has focussed almost exclusively on populations described as mentally handicapped, developmentally delayed, or autistic. Moreover, within these populations, functional assessment approaches have been directed towards individuals exhibiting high rates of self-injurious behavior or stereotypy.

Recently, Reiher (1992) has suggested that most interventions provided to behaviorally disordered students do not have a direct relationship to the diagnostic information gathered through the assessment process. Singh, Deitz, Epstein, and Singh (1991), in a review of the research investigating the treatment of children with behavior disorders, have also noted the paucity of functionally based assessment strategies prior to treatment selection. As well, Luiselli (1991) in discussing the process of assessment derived treatment for children's disruptive behavior disorders, suggested that unless practitioners can specify the variables contributing to the occurrences of a particular problem behavior under specified environmental conditions, it is likely that ineffective treatments will be implemented.

Previously, Touchette et al. (1985) had suggested that the scatter plot could be adapted to diverse settings in which frequency data is collected, including educational programs. However, a search and review of the literature (CD ROM; Psych. Lit., & ERIC) found no systematic attempts to apply this assessment technology within an educational setting. This is surprising as several researchers have recently discussed Touchette's scatter plot as an example of a functional assessment methodology, but doing so with no empirical support other than the original study (Axelrod, 1987; Lennox & Miltenberger, 1989; Luiselli, 1991).

Thus, to further demonstrate the importance of a functional assessment and to systematically extend previous research, the scatter plot method of displaying observational data was empirically field tested using an A-B single subject design in two special education classrooms. The functional assessments were based on (a) teacher collected frequency data and (b) visual analysis of the scatter plot. Hypotheses were developed about functional relations between classroom schedule antecedents and identified problem behaviors of four target students. These hypotheses, in turn, guided program planning. The present study differed from the original by using a different population exhibiting different behaviors within a different context. Specifically, the original was conducted by Touchette and his colleagues (1985) in a residential treatment centre for adolescents with autism. The present study was conducted in two elementary special education classrooms for children with behavior disorders.

CHAPTER II

Review of the Literature

Introduction

The following review examines the conceptual and procedural foundations for a functional assessment. Behavioral procedures utilizing operant procedures are reviewed. Stimulus control and setting events are discussed, providing a conceptual foundation on which to base antecedent interventions. Functional assessment is then introduced as the method required by an antecedent intervention approach for the treatment of problem behavior. Specifically, the scatter plot graph is suggested as one technique to consider when conducting a functional assessment of children's problem behavior in the context of a special education classroom.

Behavior Analysis

Operant Variables. Behavioral research has demonstrated the importance of consequences in the learning process and the control of behavior (Skinner, 1953). The Skinnerian (or radical behavioral) analysis of behavior examines a three term contingency consisting of a discriminative stimulus (antecedent)—response (behavior)—consequence. Responses occur in the presence of stimuli and are followed by consequences. Those consequences which increase the probability of the same or a similar response in the future are termed reinforcers. Experimental investigations of reinforcers and reinforcement schedules are frequently conducted with lab animals under highly controlled conditions. Applied research extends the experimental analysis to socially significant human behavior (Baer, et al.,1968,1987; Epling & Pierce,1983). Although pioneering applied work was restricted in scope, tending to focus on relatively proximal antecedents and consequences (Winett & Winkler, 1972), rapid development has led to an examination of a wide variety of human problem behavior in an equally wide number of settings forming what is typically referred to as applied behavior analysis (e.g., Hake, 1982).

The success of operant procedures to control problem behavior through direct manipulation of consequent variables is well established in applied settings (e.g., Kazdin, 1989; Martin & Pear, 1986), including community settings, (Martin & Osborne, 1980), medicine (Weiss, Herd, & Fox, 1980), and schools (Alberto & Troutman, 1982; Heward, Heron, Hill, & Trap-Porter, 1984; Wheldall, 1987). Barrish, Saunders, and Wolf (1969) provided an early example of the effects of positive reinforcement in the classroom. The researchers devised a "good behavior game" to control disruptive behaviors in the classroom. Classwide privileges were made contingent on the occurrences of inappropriate behaviors of several "problem children". The negative consequences of an individual child's misbehavior were shared by all members of the class (i.e., the loss of privileges). Results, evaluated via elements from multiple baseline and reversal designs, suggested that the game dramatically reduced the disruptive out of seat and talking out behaviors of the targeted students. More recently, the good behavior game was implemented with Sudanese students exhibiting disruptive classroom behaivor (Saigh & Umar, 1983). Using an ABAB design, Saigh and Umar evaluated the efficacy of the good behavior game in a different cultural context. The implementation of the "game" markedly decreased student disruptive behavior. The experiment tested and supported the common assumption of behaviorists that the principles of behavior are lawful and universal.

Operant or consequence based punishment procedures have also been used to modify behavior. For example, Cipani (1981) successfully reduced problematic mealtime behaviors in an institutionalized adult client with mental handicaps by removing the client's food tray for short periods of time. Additionally, the client remained seated and observed others eating. In classrooms, reprimands are a common form of punishment (White, 1975). Van Houten, Nau, MacKenziè-Keating, Sameoto, and Colavecchia (1982) have conducted an analysis of some variables influencing the effectiveness of reprimands as punishers. Three experiments were conducted. Results suggested that (a) verbal reprimands paired with a firm grasp of the student's shoulder and accompanied with eye contact were more effective than verbal reprimands without a shoulder grasp and eye contact, (b) reprimands delivered in close proximity to the student (e.g., 1 metre) were more effective than reprimands delivered from a distance (e.g., 7 metres), and (c) reprimands delivered to just one member of a student dyad effectively reduced the disruptive behavior of both members of the dyad.

Other extensions of operant methodology to classroom misbehavior have involved some form of a "token economy". A token is an object (or symbol) that by itself has no reinforcing value, but through pairing with primary or other conditioned back up reinforcers, becomes reinforcing (Skinner, 1953). An everyday example important to most of us is, of course, our society's financial system. We work and receive paychecks which in turn are exchanged for other valued goods and services. In essence, the token economy in the classroom regulates student (mis)behavior by using generalized conditioned reinforcers that are interchangeable for a variety of primary or back up reinforcers. There exists a considerable body of research reviewing the effectiveness of token economies, (Kazdin, 1982; Kazdin & Bootzin, 1972; O'Leary & Drabman, 1971; Williams et al., 1989). In general, the reviews suggested that token economies effectively control behavior over a wide range of populations, settings, and target behaviors. Problems, however, have remained in the area of follow up data assessing the maintenance and generalization of behavior change. Kazdin (1982) recommended further investigations into strategies to increase the probability that behavioral change is maintained and extended into new settings in the presence of new people.

It is evident that applied behavioral research has traditionally emphasized the consequences of behavior. However, in the words of Bijou (1970),

> The fact that...social behaviors are operants, and hence sensitive to consequent stimuli, has led many teachers and researchers to use, indiscriminantly, contrived contingencies such as tokens, candies, points, stars, etc. Such artificial reinforcers are not always necessary, and in many instances in which they have been used, they have never been functional. (p.11)

Following Bijou (1970), Stokes and Baer (1977) suggested that exclusive reliance on consequent procedures is inhibitory to the successful generalization of behavior change (i.e., the occurrence or nonoccurrence of relevant behavior under conditions other than those present during training). They recommended giving due consideration to antecedent stimulus events to ensure generalization (e.g., "program common stimuli" and "train sufficient stimulus exemplars"). Similarly, Kirby, Bickel, and Holborn (1983) have suggested that an analysis of controlling antecedent conditions is essential to establish generalization and maintenance.

While some applied investigators are now turning their attention to antecedent variables and their effects on behavior, direct applied demonstrations investigating controlling antecedent conditions and behavior change are sparse (Dunlap, Dunlap, Clarke, & Robbins, 1991). Haring and Kennedy (1991) investigated contextual antecedent variation and intervention effectiveness for problem behavior (stereotypy). Using a multielement (ABCBCB) design across two adolescents with severe disabilities (autism and Down's syndrome), Haring and Kennedy demonstrated that contextual (i.e., antecedent) variation can effect the success of interventions. Specifically, it was found that the effects of a differential reinforcement of other behavior (DRO) and a time-out procedure were dependent upon the instructional context in which they were applied, either during an activity time with tasks or leisure time. The DRO procedure reduced problem behavior in the task context but was ineffective during leisure time. Conversely, time-out was ineffective during the task activities but reduced the level of problem behaviors occurring throughout leisure time. In general, the results suggested that contextual conditions are important determinants of the social responses of individuals with disabilities. The results support the notion that antecedent stimuli are important variables to consider when planning interventions.

Stimulus Control/Setting Events. A stimulus is defined as any antecedent or consequent event that affect behavior. Stimulus control occurs when the presence of a particular stimulus occasions a particular response where that response is performed only in the presence of that particular stimulus (Kazdin, 1989). With respect to the three term contingency, a discriminative stimulus (SD) is the antecedent stimulus which signals that a certain response will or will not be reinforced (Kazdin, 1989). Thus, responding is reinforced in the presence of an SD or, conversely, the presence of a given SD will increase the probability that a similar response will or will not occur. In the words of Levis (1982):

> Stimulus control is related to the concept of discrimination and to the empirical finding that antecedent events (stimuli) can also control behavior by associating reinforcement consequences for a particular response class across different stimuli.(p.37)

However, in applied situations behavior is complex and the breadth of potential controlling stimuli is wide (Touchette et al., 1985). In fact, Epling and Pierce (1983) cautioned that most emitted behavior is multiply determined by many different factors including alternative sources of reinforcement, variables that bias responding, and conditions that affect sensitivity to the operating contingencies. These "conditions" refer to different antecedent stimulus conditions (i.e., context). The simplest case would involve a well defined discriminative stimulus which occasions a response upon every presentation, (e.g., a key-light occasions a pigeon to peck in an operant conditioning chamber) but as control decreases and the environment becomes more complex, an analysis of larger contextual variables in the organism's natural environment may be required. Contextual conditions have been addressed on at least two different levels by investigators, as (a) "establishing operations and stimuli" (Michael, 1982) and (b) "setting events" (Bijou & Baer, 1961; Dumas 1989; Kantor,1957; Wahler & Fox, 1981).

Establishing operations and establishing stimuli refer to a set of variables considered as "motivational", including the effects of deprivation or satiation and certain effects of punishment (Michael, 1982; Leigland, 1984). For example, water may function as an establishing operation if it (a) alters the effectiveness of water presentation as a reinforcer and (b) also increases the probability of occurrence of those responses which in the past have been reinforced with water.

Setting events, however, are not as precisely defined. Originally proposed to capture the complexity of the natural environment, setting events identify the presence or absence of "context" variables and environment-behavior interactions in the individual's past (Leigland, 1984). In essence, more complex, temporally removed behavior-environment interactions are hypothesized to influence behavior. For example, student-to-student interactions on the playground could affect later student-to-student interactions in the classroom. Leigland (1984) pointed out that while many conceptual and technical problems are inherent in the concept of "setting events" (e.g., no precise functional or operational definition, cf., Michael [1982] establishing operations) there is no question that it is wise to expand the environmental variables assessed by an applied behavior analysis.

A vision of behavior restricted to discrete antecedent and consequent events may limit the effectiveness of an intervention. These limitations are a function of larger contextual variables that are difficult to change via one-to-one interventions but have an effect on the problem behavior (Bilan et al., 1990). For example, Dumas and Wahler (1983) reported that poor results of parenting skills training is associated with poverty. In this case, the condition of poverty was the larger contextual variable. Similarly, Wahler and Dumas (1987) presented correlational evidence for mothers' negative extrafamilial contacts and high rate of aversive interactions with their children. In this example, a mother's aversive extrafamilial contact was the setting event affecting subsequent contacts with her child. Thus, behavioral interventions designed to ameliorate individual problems may be ineffective because the problems are a function of controlling variables outside of (a) the scope of inquiry, or (b) the nature of the intervention. In a similar vein, within a special education classroom setting, a student may be referred for treatment of a problem behavior. Assessment data and subsequent interventions which focus exclusively on the child may be restricted in their scope and effectiveness (Alessi, 1988; Kratochwill & Shapiro, 1988). Identification of strategies for modifying broader (contextual) factors are needed (Biglan, Glasgow, & Singer, 1990). For example, a student's aberrant behavior may be a function of an inappropriate curriculum, that is, one that has assigned tasks that he or she has difficulty performing. Assessment strategies should include external curricular variables rather than focussing only on hypothesized constructs within the child for explanations regarding academic or behavioral problems (Lentz & Shapiro, 1988; Shaprio & Kratochwill, 1988; Ysseldike, 1983).

In summary, a more global analysis of deviant or maladaptive behavior has become necessary (Wahler & Fox, 1981). To determine the reasons for misbehavior, behavioral research should extend its scope beyond discrete antecedent (and consequent) events (Bailey & Pyles, 1989). Setting events have been proposed to conceptually and methodologically expand the field of applied behavior analysis. Their addition into the conceptual network of behavior analysis could provide important information on the general conditions supporting the occurrence of challenging behaviors in children (Dumas, 1989; Repp & Singh, 1990). In particular, there is a need to investigate the influence of broad, antecedent curricular variables on student problem behavior (Dunlap et al., 1991; Glynn, 1982).

Antecedent Interventions

As discussed above, behavior occurs within a context and can be considered a function of the environment. An antecedent intervention consists of (a) showing that a behavior occurred as a result of the stimulus preceding it, and (b) that changing the antecedent event changes or modifies the behavior (Bailey & Pyles; 1989). Essentially, antecedent (or ecological) manipulations refer to planned environmental modifications that in turn may change behavior (LaVigna, Willis, & Donnellan, 1989). Applied researchers are increasing the scope of their antecedent manipulations to include changes in setting (Horner, 1980), changes in instructional methods (Winterling, Dunlap, & O'Neill, 1987) and modifications of instructional goals (Donnellan, 1980).

Others, however, have noted that very few studies attempt to investigate the direct relation between problem behavior and antecedent, curricular interventions (Dunlap et al.,1991; Singh et al., 1991). While the role of different contexts and settings are currently under renewed investigation in applied behavior analysis (e.g., Haring & Kennedy, 1990) and other fields (see Morris, 1988), few direct demonstrations exist in the applied behavioral literature on antecedent interventions in school settings.

Recently, however, Dunlap et al. (1991) have extended the applied behavioral research by demonstrating the relationship between information gathered through an assessment of curricular variables and antecedent interventions for behavior problems. Specifically, the results of a functional analysis were related to behavior problems and curricular variables for a 12 year old female subject. "Jill" had received many diagnoses prior to this study including severe emotional disturbance, mental retardation, attention deficit disorder, and schizophrenia. Apart from academic difficulties, Jill displayed a number of problem behaviors in the context of her public school education program including aggression to others and property, profanity, perseveration/delusional speech, and spitting. A hypotheses testing approach was incorporated to (a) determine the conditions under which the problem behaviors occurred and (b) guide the design of a functional intervention based on an individualized curriculum package for application during the entire school day (Dunlap et al., 1991).

In Phase 1 of the study, data was collected over a five week period from a variety of sources including standardized instruments, direct observations, rating scales, and an 11-item questionnaire. The accumulated results produced a number of common themes leading to four hypotheses related to observable variables that could be manipulated within a school context. Observational data was collected using an interval system and displayed using a standard line-graph (cf. Touchette et al., 1985). Over a span of four days in a room adjacent to her regular classroom the hypotheses were tested using short baseline-intervention-baseline designs, (A-B-A withdrawal). Jill's curriculum was subsequently revised to accommodate elements associated with low rates of problem behaviors and high rates of positive behavior. The curricular changes and subsequent behavior changes were evaluated using a multiple baseline design across time.

Dramatic reductions in problems behaviors were clearly evident immediately upon introduction of the revised curriculum (in fact disruptive behavior fell to zero rate with the exception of one day). Positive behaviors (e.g., on task and appropriate vocalizations) subsequently improved. Dunlap et al. (1991) suggested the following issues as important ingredients in their successful demonstration; (a) the procedure was conducted in the individual's natural context (i.e., in Jill's school environment) allowing for specific school-related antecedents to be identified and, (b) the assessment procedures were directly linked to the interventions. Their conclusions were qualified with the following observations: first, in all probability not all of the variables maintaining Jill's problem behavior were identified, therefore some form of continuous ongoing functional assessment would be necessary; second, a highly individualized program may be poorly received by administrative personnel; and finally, since the intervention could be considered a package, it was difficult to speculate on the relative contribution from each component. It was suggested that further research was required to (a) more fully understand the effects that curricular and other stimulus events have on the occurrence of problem behavior and (b) continue to develop more practical functional assessment technologies (Dunlap et al., 1991).

In another study examining antecedent intervention, Brown (1991) presented a number of factors to consider when manipulating stimulus setting events. Supporting her claims with case study examples involving adults with mental handicaps, Brown suggested that systematic changes within the natural context of a person's daily routines can significantly affect challenging behavior. Antecedent analysis may also ensure more rapid and complete control over problem behaviors than manipulating consequences alone. Thus, Brown included activity schedule changes with skill building/educational strategies rather than applying a separate and distinct behavior reduction package.

Brown's (1991) four planning dimensions included time (time-based vs. open), content (set vs. choice), sequence (single vs. chain), and measurement (what to measure). Briefly, the time dimension refers to how and when routines occur across the day, content references the form of a given activity, sequence refers to temporal pattern of successive activities, and measurement identifies what should be measured.

Utilizing these dimensions, Brown (1991) systematically explored how a change in one, some, or all could be used to address challenging behaviors in positive ways. Brown concluded that future research is needed to validate and expand our understanding of how schedule changes can affect behavior. Specific research is needed to ascertain which dimensions functionally control behavior. At present, educated guesses appear to be in the forefront of assessment rather than solid, empirically derived, criteria-guided decisions.

Antecedent procedures used to reduce problem behaviors are considered by many to be nonaversive and more ethical than some "traditional" behavioral approaches (Axelrod, 1987; LaVigna & Donnellan, 1986). Indeed, both molecular and molar antecedent analysis (i.e., traditional antecedent/consequent analysis and setting event assessment, respectively) may be considered an integral component of behavior management programs utilizing nonaversive procedures (LaVigna & Donnellan, 1986; Luiselli, 1990). A controversy, however, exists in the use of aversive versus nonaversive methods to manage problem behavior. While many people agree on the need to decrease intense, high rate destructive or disruptive behavior, differences abound concerning how it ought to be done (Repp & Singh, 1990).

Aversive procedures are seen by some as an effective (and often necessary) method to control problem behavior (for a recent review of the issue see Repp & Singh, 1990). Donnellan and LaVigna (1990), however, suggested that the necessity of aversive control is a myth supported by (a) a predisposition to punish that which offends us, (b) our childhood social learning experiences, and (c) our professional training. The issue, Donnellan and LaVigna maintain, is whether those concerned with understanding and assisting people exhibiting severe and challenging behavior are capable of arranging environments that promote adaptive behavior and decelerate maladaptive behavior.

Unfortunately, aversive methods are often used as a last resort and as such have gained a certain status in being viewed as more effective than positive reinforcement in reducing aberrant behavior. Previous positive attempts that are cited as unsuccessful should be reanalyzed as previous attempts that were unsuccessful because the reinforcing events were presented in a manner that was not sufficiently reinforcing under the current conditions (Donnellan & LaVigna, 1990).

The contextual nature of aberrant behavior is further recognized by Donnellan and LaVigna (1990) when they ask

> Why would an operant that is demonstrably changeable by one set of stimulus events (aversive events) not be equally changeable by another set of stimulus events (reinforcing events)? (p. 36)

They go on to stress that the topography of events should not make the difference in the choice of treatment procedures (i.e., aversive vs. nonaversive). Recent findings, however, have demonstrated that acceptability of treatment does indeed vary as a function of the severity (i.e., the topography) of the target behavior (Tarnowski, Rasnake, Mulick, & Kelly, 1989). But if severe and challenging behaviors are to be understood within a contextual and functional framework, then the choice of methods may be reduced to those which assess the controlling variables. Such methods are frequently designated as nonaversive, (e.g., stimulus control, instructional control, positive programming) and all necessitate assessment prior to implementing antecedent changes.

In summary, there is a growing recognition within applied behavior analysis that attention needs to be directed to the study of antecedent stimuli controlling human behavior (Glynn, 1982). Several researchers (Dumas, 1989; Glynn, 1982; Wahler & Fox, 1981) have suggested that these broader contextual conditions themselves (i.e., setting events) may be potential controlling variables setting the occasion for problem behaviors in educational settings. Furthermore, in educational settings, these so called "setting events" may be amenable to modification and hence may yield more efficient strategies for changing behavior than reinforcement strategies alone. In fact, for truly effective treatment, setting events may be an essential consideration when program planning. Wheldall (1981) has suggested that increased emphasis on ecological variables pertaining to classroom management would reduce the introduction of often restrictive, unnecessary, and time-consuming contingency management systems (i.e., token economies). Elsewhere, McNaughton (1980) argued that, rather than rigidly control behavior through reinforcement programs, proactively arranged settings (i.e., ecological or antecedent manipulations) may, ultimately, be more beneficial to the student in the long term.

Further research into the design and manipulation of various types of setting events could enhance students' educational environments. More precise scheduling of activities for children may reduce the frequent need to resort to remedial, reactive contingency management programs (Glynn, 1982). In classroom research, for example, the influence of one type of setting event (curricular variables) needs to be addressed (Dunlap et al., 1991). The primary method for such an investigation would rely on a functional assessment.

Functional Assessment

The objective of a functional assessment is to identify antecedent or consequent stimuli that set the occasion for problem behaviors. A functional assessment may be conducted to locate the reinforcing consequences of a problem behavior, which may then lead to the elimination or prevention of their occurrence, or it may focus on the antecedent conditions setting the occasion for the problem behavior. Practitioners may either eliminate the identified conditions or change their characteristics to prevent the behavior from occurring (Lennox & Miltenberger, 1989; Weeks & Gaylord-Ross, 1981). Essentially, a functional assessment identifies antecedent or consequent events setting the occasion for or maintaining a target behavior. Naturalistic observation is used rather than experimental manipulation wherein the student is typically removed from his or her natural context to test controlling variables (Lennox & Miltenberger, 1989). By using an empirically–based, functional approach a framework can be developed to analyze possible antecedent events affecting the individual and maintaining problem behavior. While traditional accounts of problem behavior in children (e.g., psychodynamic, humanistic, biogenetic, etc.) frequently make reference to a variety of internal factors (for a review see Cullenan, Epstein, & Lloyd, 1991) there is little emphasis placed on the various contextual conditions or the complex interaction between behavior and environment.

On the other hand, a behavioral analysis attempts to identify the supporting variables and stimulus conditions that control the occurrence of target behaviors (Dunlap, et al., 1991). Scrutiny of contextual events setting the occasion for undesirable behavior (and at the same time failing to set the occasion for desirable behavior) is important in order to promote a clear link between assessment and intervention (Kratochwill & Shapiro, 1988). Specifically, hypothesis about potential controlling variables (i.e., "causes") can be developed and tested to demonstrate directly the tie between the assessment and the intervention.

For example, Repp, Felce, and Barton (1988) demonstrated the use of functionally derived hypotheses in the treatment of stereotypic and self-injurious behavior. It has been found that for stereotypic or self-injurious behavior, no single intervention technique is universally effective (Carr, 1977). One reason for this finding, may simply be that people engage in these behaviors for different reasons. Specifically, three main hypotheses exist about the development and maintenance of these aberrant behaviors. These are (1) self-stimulation, (2) positive reinforcement, and (3) negative reinforcement. Interventions that are not compatible with one of these "causes" of the problem behavior are likely to fail (Carr, 1977; Repp et al., 1988). For effective treatment, programs must be developed that "match" the cause of the behavior (i.e., that target the controlling variable). Repp et al. examined this process by first comparing the effectiveness of each of the three hypotheses mentioned above with one another in a three-phase study across three subjects with severe disabilities. Secondly, they developed an intervention technique based on a functional analysis of the problem behavior for each subject. Third, this functionally based intervention was compared for effectiveness with the previously tested hypotheses. In all three cases, the intervention procedures developed on the basis of individual functional analyses were more effective in the treatment of the subjects' stereotypic or self-injurious behavior than the a priori hypotheses testing procedure. In general the work of Repp et al. supported the idea that treatment procedures should be based on individual assessments of the behavior in its environmental context.

In a recent review of intervention studies targeting the social behavior of students labelled seriously emotionally disturbed or behaviorally disordered, Singh et al. (1991) cited the lack of a functional analysis conducted prior to intervention as a major shortcoming. It was found that approximately half of the studies reviewed were performed for the sake of conducting experimental research. The reviewers suggested that subjects were selected to investigate a predetermined intervention "package" with little regard for their individual needs. Such tactics in applied research have been noted previously by Gardner and Cole in 1983 when they described different forms of "preintervention bias" in which intervention is implemented without a preliminary functional analysis. Interventions selected on a predetermined basis are necessarily limited in (a) their chance of gaining control over inappropriate behavior, (b) generating clear treatment gains, and (c) promoting successful generalization and maintenance because they lack functional data about the controlling variables (i.e., the causes of the misbehavior).

Haring and Kennedy (1990) investigated the impact of context on the efficacy of two different interventions (differential reinforcement of other behavior [DRO] and time–out) with students exhibiting severe behavior problems. They proposed that problem behaviors may be functionally dependent on the context in which they occur and vary accordingly. Thus a functional analyses limited to just one context may be insufficient when designing a behavior management program across an entire day. Implicit in this is that assessment and intervention need to be sensitive to the individual's naturally occurring contexts and routines (Brown, 1991). Various natural contexts may involve school classrooms, hallways, lunch-rooms or cafeterias, group homes, and residential wards. In each case a functional assessment may be warranted to better reflect each individual's preferred mode of interacting with the environment.

Lennox and Miltenberger (1989) have reviewed three of the most frequently used functional assessment methods: informal assessment, direct observation, and experimental analysis. The three categories vary with regard to empirical integrity and rigour. Informal assessments including behavioral interviews and behavioral checklists, while useful, provided the least reliable information about controlling variables. Direct observation occupied the intermediate level of precision and reliability. Two examples of direct observation discussed by Lennox and Miltenberger included the scatter plot (Touchette et al., 1985) and ABC assessment (Bijou, Peterson, & Ault, 1968). An ABC assessment attempts to evaluate the immediate antecedent and consequent stimuli surrounding the target behavior. A literal description of the "stream of behavior" is recorded to determine which stimuli are related to the occurrences of the target behavior. Finally, experimental analyses explicitly manipulate the possible controlling variables. During an experimental analysis, behavioral changes are continuously monitored as various antecedent or consequent events are repeatedly presented and withdrawn. This method allows a great degree of precision in determining which variables are functionally related to the indentified problem behavior (Axelrod, 1987; Lennox & Miltenberger, 1989).

The degree of control required by an experimental analysis, however, can be quite difficult to obtain in the natural environment. It is often necessary to arrange analogue environments wherein the contingencies are contrived, but closely approximate those operating in the natural environments. Once the controlling variables have been identified, the investigator can test the identified contingency relations in the learners natural environment (Dunlap et al., 1991; Lennox & Miltenberger, 1989). Additional disadvantages of experimental analyses include (a) the analogue environment as typically designed may not allow for naturalistic observation (b) multiple treatment interference wherein confounding variables may be present across the different experimental phases associated with alternating treatments or by the carry over effects associated with sequentially presented treatment and baseline conditions in reversal designs, (c) the amount of time required which may delay potentially effective treatment, and (d) it is often impractical in applied settings to arrange the conditions for an experimental (functional) analysis (Lennox & Miltenberger, 1989). In view of the difficulties surrounding experimental analyses, the scatter plot is suggested as an effective, but relatively simple, method to gather functional assessment data prior to implementing an antecedent intervention (Luiselli, 1991).

Scatter Plot

Touchette et al. (1985) proposed the scatter plot technique for displaying data to facilitate functional assessments and subsequent interventions. Daily frequency observations are plotted on a grid with time of day located on the ordinate and days of the week along the abscissa (see Appendix 1). Correlations are noted between time of recording and high rates of problem behavior. The scatter plot is then used to note relations between temporal patterns in identified problem behaviors and environmental variables (e.g., academic tasks). The graphing method differentiates between low, medium, and high frequencies of problem behavior within specified time intervals appropriate to the individual's schedule.

Citing Ferster and Skinner's (1957) observation that overall response rates (for some behaviors) are typically composed of "short bursts of responding at a constant local rate alternating with periods of no responding"(p. 27), Touchette et al. (1985) have suggested that severe problem behaviors typically follow this pattern and that a scatter plot can assist in identifying response patterns in natural contexts. Frequently utilized methods of averaging response frequency over time (i.e., the typical line graph) are criticized because they only represent the average rate of responding and do little to suggest probable sources of stimulus control. Since severe behavior problems usually occur at two practically and socially important rates (zero and unacceptable) a scatter diagram, visually displaying times in which problem behaviors occur infrequently, continuously, or somewhere in between, would seem to be of some value when conducting a functional assessment. Through a series of case examples, Touchette et al., demonstrated how a scatter plot can facilitate the identification of relationships between problem behavior and environmental stimuli by altering an individual's schedule, activities, setting or instructors.

Case Study One involved a 14–year–old functionally mute girl whose history of serious aggression had necessitated placement in a residential school for adolescents labelled autistic. A scatter plot was used to identify environmental events associated with assaulting people. Data was collected throughout "Joan's" waking hours. An ineffective time-out procedure remained in place to protect other students. It was also noted that previous interventions had been unsuccessful in reducing Joan's rate of assaults.

Observational data was initially displayed via a traditional line graph which did little to suggest controlling environmental variables. The data was then replotted onto a scatter plot grid where several patterns were revealed; the most notable being that Joan's assaults were most frequent between 1:00 and 4:00 p.m. Monday through Thursday. Of equal importance for intervention were the time periods in which assaults were absent.

Joan's activity schedule was subsequently revised in accordance with the scatter plot patterns. Conditions associated with assaultive behavior were replaced with conditions associated with positive behavior. The schedule revision immediately decreased Joan's aberrant behaviors and increased positive behaviors. Eventually, original program elements associated with assaults were gradually reintroduced into her afternoon schedule. A 12–month follow up revealed that Joan was fully integrated into afternoon group classes for 3 of the 4 hours with structured individual activities offered in the fourth.

In Case Study Two, Touchette et al. (1985) presented "Tom", a self–injurious 23 year old male living in a community residence with other adults described as autistic. A scatter plot was used to identify variables associated with Tom's self–abusive behavior. During the period of time covered by the analysis, Tom remained on a DRO 5' schedule which made available a small amount of food for consumption following each 5 minute interval free of self–abuse.

Scatter plot data collected over 5 days revealed that Tom's self–abuse occurred primarily during the late afternoon and early evening. There were three main elements that changed in Tom's day at 3:00 p.m. — activities, schedule, and staff. The element first manipulated was the staff. The morning aide assigned to work with Tom was reassigned to work the afternoon shift while the afternoon aide worked the mornings. No other changes were made.

An immediate shift occurred in Tom's self–injurious behavior following staff schedule changes. The morning period became associated with self–abuse while the afternoon was abuse free. A return to the original staff schedules displaced Tom's self–abusive behavior back to the late afternoon and evening. While Touchette et al., suggested that no clear explanation was available for the disparity between the two aides, it was clear that something subtle was affecting Tom's behavior. Eventually, the problem was solved when Tom began attending a sheltered morning workshop and the aide associated with low rates of self–injurious behavior was rescheduled to the late afternoon shift.

Finally, Case Study Three demonstrated how apparently random scatter plot data may be produced by an unstable environment. "Jim", a self–abusive 15–year old autistic adolescent, hit his face and slammed his head into walls or furniture from 50 to 1500 times a day. Overcorrection and punishment procedures were in effect during the first 10 days of data collection prior to any schedule revisions. Upon inspection of the collected data, no stable trend or patterns emerged nor did any stable program elements appear to be correlated with what Jim did, when, where, and with whom. It appeared that Jim's "low demand/high reinforcement density schedule" along with mild punishment did not reduce daily response rate.

Jim's program involved a menu board from which he was offered several choices every 30 minutes. He indicated the activity he preferred and continued with it for 30 minutes or until he withdrew his attention. Frequent staff rotations were necessary because of the difficulty in supervising Jim. Since staff and activities were constantly changing, it appeared that time of day alone influenced self–abuse or, conversely, perhaps Jim's unstable, continuously changing activity schedules controlled abuse.

A fixed schedule of activities was developed for Jim. "Setting–activity" combinations were arranged along a continuum; those guaranteed to produce self–injurious behavior (rated as 5's) to those most likely to promote positive behavior (rated as 1's). While necessary daily hygiene activities were included in the revised schedule, all other time periods were correlated with activity–setting combinations ranked as 1's, 2's, or 3's (i.e., those activities least likely to produce self-abuse).

The new schedule was successful in reducing Jim's overall rate of self–injurious behavior. Furthermore, a definite pattern emerged. Jim's self–hitting occurred primarily in the evening. A second activity–schedule program revision was made to make his evening program more closely resemble the morning program. Jim's self–abuse was further reduced with a noticeable increase in positive behaviors.

The above case illustrations by Touchette et al. (1985) suggest that the scatter plot grid may be a viable method for organizing behavioral data when conducting a functional assessment. The need for a formal functional assessment using a scatter plot can arise when a behavior of concern occurs frequently, but informal observations produce no reliable correspondence with any one event that might be controlling inappropriate behavior. At this point, traditional approaches might look within the individual, hypothesizing underlying pathological determinants, but a contextual account broadens the search for relevant environmental variables. The patterns of behavior that emerge on a scatter plot can assist in identifying possible controlling stimuli. While the process of identifying precise controlling relations is difficult, Touchette et al. maintain that it may be unnecessary. An alternative approach locates broadly defined contextual (controlling) events and pursues a detailed functional analyses through hypothesis testing only if broad based manipulations are not effective in achieving the desired end.

Antecedent Interventions and Students with Behavior Disorders

The research reviewed above has almost exclusively been limited to populations considered mentally handicapped, developmentally delayed, or autistic. Moreover, within these populations, functional assessments have been directed towards those individuals exhibiting high rates of self-injurious behavior or stereotypy. Research investigating other populations exhibiting other problem behaviors is needed. Indeed, if the principles of the three term contingency are considered to hold across species, then surely the functional analysis would work equally as well applied across different populations of humans.

Surpisingly, reviews of the literature for children with behavior disorders have noted an extreme lack of evidence for interventions guided by functional assessment data. No specific studies could be located using a functional antecedent assessment approach, as outlined above, for children with behavior disorders (Luiselli, 1991; Singh et al., 1991). Reasons for this are unknown. It is this researcher's opinion that two factors may be contributing to the lack of functionally derived treatment. One is that the general field of special education involving behavior disorders appears "caught up" with issues surrounding diagnoses. These problems relate to our traditional assessment practices (Algozzine, Morsink, & Algozzine, 1988, Ysseldike, 1983) A second problem appears to be that behaviorally oriented practioners working with school-aged children identified as emotionally disturbed or behaviorally disordered typically look for techniques defined by their effect, (i.e., procedures that reduce behavior) rather than conducting a functional assessment to match the intervention to the behavior in its environmental context (O'Neill, Horner, Albin, Storey, & Sprague, 1990).

Indeed, Reiher (1992) has noted that interventions provided to behaviorally disordered students do not always have a direct relationship to the diagnostic information obtained. Reiher further suggested that the types of procedures used in the assessment have an effect on the ease with which the information obtained can be translated into interventions. As previously noted, traditional evaluation (assessment) techniques typically rely on within-student causal factors for the observed behavior problems. Little formal concern is given to environmental influences. To this end, Reiher advises using systematic behavioral observation and measurement to specify the behavioral domains of interest. Assessment approached in this fashion may strengthen the relationship between initial evaluation and subsequent intervention.

Summary

In summary, the experimental analysis of behavior has clearly established the importance of antecedent and consequent stimuli in the control and understanding of behavior. Investigations extending basic behavioral principles to human behaviors of social importance are termed applied behavior analyses. Early applied behavior analytic work was criticized for a restricted vision of complex human behavior to its immediate consequences (Winett & Winkler, 1972). Although applied behavior analysts have traditionally focussed on the consequences of problem behavior, recent research has found that the success of contingency management procedures can be context dependent (Haring & Kennedy, 1991). Others have suggested that interventions which explicitly consider antecedent conditions or events are more likely to be succesful (McNaughton, 1980; Wheldall, 1981).

To address the effects of antecedent conditions on problem behavior some researchers have adopted a functional approach to assessment prior to intervening. Functional interventions are based on observational data and seek to identify the variables and stimulus conditions that maintain and govern the occurrence of problem behaviors. Conceptual foundations for this broad based approach are provided by setting events (Wahler & Fox, 1981). The use of antecendent approaches, based on direct observation and functional assessment, have demonstrated success in controlling severe problem behavior (Dunlap, et al., 1991).

However, most functional assessments of challenging behavior are conducted with individuals with mental handicaps exhibiting self-injurious and stereotypic behavior (Day, Schussler, Larson, & Johnson, 1988, Dunlap et al., 1991; Durand & Carr, 1987; Haring & Kennedy, 1990; Repp, et al., 1988; Touchette et al., 1985). Research investigating other populations who exhibit other problem behaviors is needed. For example, reviews of the literature for children with behavior disorders have noted an extreme lack of evidence for interventions guided by functional assessment data. No specific studies could be located using a functional antecedent assessment approach, as outlined above, for children with behavior disorders (Luiselli, 1991; Singh et al., 1991). This is surprising and somewhat distressing since the literature has suggested that successful interventions are context dependent and require some form of functional assessment.

Purpose of the Study

In view of the issues summarized above, the purpose of this study was to utilize the scatter plot to assess the functional relationship between special education classroom environments and behavior disordered students. Specifically evaluated was the extent to which classroom scheduling, guided by teacher collected data and visual analysis of the scatter plot, could be modified to reduce the occurrence of identified problem behaviors. Particularly important was the process of hypotheses development and subsequent schedule change decisions. To this end, functional assessment guidelines were proposed to use in conjunction with a visual analysis of the scatter plot.

The present study was conducted with four elementary aged students diagnosed as emotionally or behaviorally disordered. This study differed from the original by using a different population exhibiting different behaviors within a different context. Specifically, the original was conducted by Touchette and his colleagues (1985) in a residential treatment centre for adolescents with autism, while the present study was conducted in an elementary special education classroom for children with behavior disorders. This population was chosen primarily because (a) none of the studies reviewed have specifically investigated functional assessment using the scatter plot with behavior disordered children in a classroom context and (b) the scatter plot may be a useful tool and of future benefit for the classroom staff associated with this project. Thus, to add to the literature investigating functionally based, behavioral interventions, the efficacy of Touchette et al.'s scatter plot for displaying behavioral data when conducting a functional assessment of problem behavior was addressed with a population and within a context different than the original study.

While the procedure produced only a "rough representation of rate" and did not identify any discrete controlling variables, previous results suggested the method was effective in guiding interventions to reduce high rates of self-injurious behavior. As suggested by Touchette et al. (1985), the array of possible controlling stimuli may be too broad to test in uncontrolled applied settings. Thus, it is possible that broad-based functional assessment methods may play an important role in curriculum planning for students considered emotionally disturbed or behavior disordered. Essentially, the graphing method (as used in this study) differentiated between low, medium, and high frequencies of problem behavior per thirty minute interval. The daily observations were plotted on the grid and correlations were noted between time of recording and high rates of problem behavior. Daily observational data was then used to assist in program planning for four students considered behavior disordered. The major dependent variable evaluated was the rate (i.e, frequency count per unit of time) of a specified target problem behavior for each student. Baseline and intervention data were collected for three months via direct observation by the teaching staff during the academic portion of the student's school day (approximately 4.5 hours). Results of the study, according to (a) baseline rate of the target behavior, (b) the hypotheses regarding the controlling variables, and (c) the change in behavior after intervention, are presented in Chapter Four. Additionally, a questionnaire was administered to the teaching staff involved in the present study. Their comments and concerns are summarized and presented in Chapter Four. In Chapter Five, results are discussed with suggestions made regarding future research, functional interventions, field studies, and experimental analyses.

CHAPTER III

Methods and Procedures

Introduction

The methodology and procedures for the study are presented in detail in this chapter. Descriptions of the participants, settings, and methods of data collection are provided. A sample scatter plot with hypothetical data is reviewed. The research design, data analysis, intervention techniques, and social validity questionnaire used are also discussed.

Participants

Subject selection criteria. Students whose behavior warranted full-time placement in a self–contained special education class for behaviorally disordered students were initially targeted. Gaining access to the classrooms was mediated by a divisional school psychologist whose decision-making process remained essentially unknown to the researcher. It was known, however, that within the system several new staff were beginning in the behavior management classrooms. In was felt that the presence of the researcher and the general requirements of the study would be too great a burden for these new staff.

Once access to the classrooms was obtained, discussions between researcher, teacher, and aide about potential students facilitated the selection process. Concerns and criteria included the need for a behavior occurring frequently (e.g., greater than 10 times a day), the extent to which this behavior was a "problem" (i.e., limiting access to integration), and the ease with which the behavior could be operationally defined and counted.

Student profiles. Four male students enrolled in two different (two in each) self–contained special education classes for children with behavior disorders participated as subjects. These classes will hereafter be referred to as Behavior Management Classes (BMC). The subjects ranged in age from 8 years 2 months to 12 years 4 months. A more complete description of subject characteristics may be found in Table 1.

Table 1.

Student Characteristics

Student 1:	- Male, 8 years 2 months - Diagnoses: attention deficit with hyperactivity - Medication: Ritalin, 5 mg. AM and PM - Average cognitive abilities - Characteristics: impulsive, hyperactive, and aggressive
Student 2:	- Male, 8 years 3 months - Diagnoses: attention deficit with hyperactivity - Medication: Tegretol (for tics) - Superior cognitive abilities - Characteristics: socially and emotionally delayed relative to his intellect, short attention span, unpredictable behavior, talks incessantly, constantly fidgeting
Student 3:	- Male, 12 years, 4 months - Diagnoses: unknown - Medication: none - Below average cognitive abilities - Characteristics: numerous family social problems (e.g., alcohol abuse, neglect, family violence, family dissolution)
Student 4:	- Male, 9 years, 2 months - Diagnoses: attention deficit disorder - Medication: none presently, - Average cognitive abilities - Characteristics: history of sexual abuse

Staff. One teacher and one instructional assistant per classroom participated in the study. Both teachers were male and both aides were females. Each teacher had a minimum of 3 years experience working in BMC classrooms and 2 years teaching experience in general education classrooms for a total of 5 years of teaching experience. One instructional assistant had been working in a BMC for 6 years while the other had 7 years of similar experience. Both teacher/assistant pairs had been working together for 3 years.

Setting and Class Schedules

Two elementary BMC classes in the Edmonton Catholic School System served as the setting for this study. Classroom 1 had five students ranging in age from 8 years 11 months to 12 years 4 months with academic placements from the third to the sixth grade. Classroom 2 was composed of seven students whose age ranged from 6 years 2 months to 11 years. Academic placement in Classroom 2 spanned grades 1 to 6. In both classes, all students were male.

The two classrooms had well established academic routines. Mornings typically began with Language Arts followed by Math. Each class periodically devoted time to pro-social skills teaching (e.g., role playing the correct manner to ask to join a game on the playground). Afternoons were less academically oriented with students working on various projects (e.g., art, recycling). The daily class schedules for Classroom 1 and 2 are presented in detail in Appendices 2 and 3, respectively.

In addition to the normal classroom routines, Classroom 1 had implemented a "step chart" contingency plan. Essentially, the system consisted of five "steps", which determined the amount of access to privileges for each student (e.g., access to integration, access to scheduled special events). Movement up or down the step chart was dependent on the child's behavior. Behaviors resulting in step chart movement were clearly posted as was the step chart itself. Problem behaviors were further differentiated into majors (e.g., fighting) and minors (e.g., teasing). The occurrence of a major resulted in one step down the chart. Three minors equalled a major and subsequently a step down. Movement up the step chart was contingent on the nonoccurrence of problem behaviors and the occurrence of positive behaviors. At the end of each school day, the teacher would have each student raise or lower their name tag on the chart.

As well, Classroom 2 used a line-up procedure after each scheduled break in the academic day (e.g., morning recess, lunch). When the students entered the school they were greeted by the teacher and aide at a specified outside entrance. Once all of the students were indoors, the class proceeded as a group up a set of stairs to their lockers. The lockers were located on a wall opposite the BMC. Each student's name was posted on the wall to designate where he was to stand. Following locker duties, each student was then expected to line up, quietly, under his name tag. The teacher and aide would take a few moments for general announcements and words of encouragement prior to sending the students into the classroom. In general the line-up procedure was intended to organize the students prior to entering the classroom following the major transition times throughout the day.

For both classrooms, a time-out procedure contingent on inappropriate behavior was in effect. Inappropriate behaviors included refusing to follow a request, hitting a fellow classmate, and throwing objects. In each case, students were sent to designated time-out rooms or areas for various lengths of time. No data was collected to assess the effects of time-out.

Dependent Variables

One problem behavior was identified for each student. Prior to beginning the study, the researcher met with the teaching staff to discuss potential students and target behaviors. Consideration was given to behaviors which occurred frequently (e.g., greater than 10 times per day), the extent to which this behavior was problematic in limiting access to regular education integration, and, finally, the ease with which the behavior could be operationally defined and recorded. Frequency counts of the occurrences of problem behavior per thirty minute interval were the dependent variables. The students' target behaviors and definitions are presented in Table 2.

Insert Table 2 about here

Table 2

Definitions of Student's Problem Behavior

Student	Behavior	Definition
1	Talking out of turn	Speaking out in class or line-up without first raising hand.
2	Talking out of turn	Speaking out in class or line-up without first raising hand.
3	Inappropriate declarations about events or people.	Any occurrence of an inappropriate vocal comment about another person or an event that occurred to himself or another person.
4	Noncompliance	(i) Failure to comply with staff request within three seconds. (ii) Instances in which R verbally protested a request or task.

Student 1. For Student 1, talking out of turn was considered by the teacher and aide to be a significant problem, one they felt was necessary to modify to facilitate regular education integration. As well, it was relatively simple to count and record. Thus the dependent measure was a frequency count of talking out of turn in the classroom and during line-up. Talking out of turn was considered to have occurred for any instance that T spoke out in class or line up without first putting up his hand. For example, talking out of turn would include shouting an answer during a group math quiz without having (a) first put up his hand and (b) getting called upon by the teacher or the aide for an answer.

Student 2. Talking out was also felt by both teacher and aide to be a significant problem for Student 2, (see Table 1). It occurred at a high frequency and was relatively easy to observe and count. The same definition was applied as that used for Student 1 above.

Student 3. Student 3's ability to remain focussed on a task or activity was disrupted by his frequent negative or inappropriate comments made during class time. It was suggested by the aide and teacher that this behavior was of concern because (a) it was inappropriate and therefore limited opportunities for integration and (b) it frequently distracted other students. Subsequently, B's inability to "mind his own business" was defined as any instance where B made an inappropriate comment about (a) another person or (b) an event that had occurred to him or others. For example, in an instance where students were involved in individual desk work and B loudly declares to another student "Your uncle is an idiot!" would be scored as one occurrence of an inappropriate declaration. Context, of course, is an important consideration in defining whether something spoken is inappropriate or not. The teacher, aide, and researcher were sensitive to this point.

Student 4. It was felt by R's teacher and aide that his noncompliant behavior was a main "contributer" to his BMC placement and significant in delaying or preventing his reintegration into a regular education class. Subsequently, Student 4's target behavior was identified by both teacher and aide as noncompliance. Noncompliance was considered to have occurred in instances where he was given a request but failed to comply within three seconds and instances in which he protested a request or task. Noncompliance was also considered to have occurred in the event that R did not complete the well-established morning routines. For example, if R was asked to clear off his desk and get his pillow for the morning relaxation drill but refused, then one occurrence of noncompliance would be scored.

Data Collection

Recording System. All four staff agreed to collect data by recording the frequency of target behavior occurrence on specially designed data collection sheets. Copies of the data collection sheets may be found in Appendix 4. Frequency data was collected continuously by the teaching staff throughout the academic portions of the student's school day (approximately 4.5 hours). Intervals spanning recess, lunch, physical education, field trips, and other "special" occasions were not recorded for two related reasons. Accurately recording in environments other than the BMC was deemed to be too difficult. For example, it is unlikely that a teacher or aide could reliably record such a specific target behavior as talking out of turn during a field trip to a Chinese restaurant. Secondly, it was decided to limit recording to only the classroom context to reduce additional confounding variables introduced by multiple environments.

Measurement of student behaviors was conducted in Classroom 1 by the classroom teacher. In this class the teacher placed both behavior recording forms (one for each subject) on his desk and, over the course of the day, would simply place a stroke in the appropriate time interval box to indicate one occurrence of the target behavior. The teacher, rather than the aide, recorded for both students because (a) his desk was located in closer proximity to the target students and (b) he was already recording other student behaviors, so the additional sheets, once learned, were not difficult to accommodate. As well, the students were less likely to be aware of the additional behaviors being recorded.

In Classroom 2, both the aide and teacher participated in recording, each observing one student. Small, simple to use, hand held frequency counters were used to assist counting. At the end of each 30-minute time interval, the displayed number would be written down in the appropriate time interval and the counter reset to zero for the next interval.

Scatter Plot. Collected data was visually displayed via a scatter plot grid (Touchette et al., 1985). A sample scatter plot with hypothetical data may be found in Figure 1. A scatter plot essentially segments the time of day into units appropriate for an individual's timetable (e.g., hours, quarter hours). All four students' days were segmented into approximately 30 minute intervals. The horizontal axes represented successive days and the vertical axes represented time of day. Data were plotted onto the scatter plot by the researcher. Blank cells indicated low rates of problem behavior while filled cells indicated occurrences of problem behavior. Thus, blank cells did not necessarily mean zero occurrences of the problem behavior but reflected a rate that was "tolerable" and perhaps realistic (i.e., it would be difficult to conceive of 0 instances of talking out during an entire school day).

Insert Figure 1 about here

Each scatter plot cell represented a period of observation and therefore a unit of time designating whether the behavior occurred at a high, medium, or low rate (i.e., frequency/time). For all students, a shaded square represented a high rate, a shaded circle a medium rate, and a blank square a low rate. Determination of rate was primarily based on initial baseline data (one week) and team meetings with the teachers and aides. While the most acceptable rate may be zero for inappropriate behavior, even occurrences of lower than usual frequencies can reflect important changes and guide immediate and long term programming. Patterns typically emerge when several day's data are plotted and visually inspected. Variables associated with the observed rates are then evaluated. Problem behavior may be related to time of day, significant others present or absent, social interaction, type of activity, reinforcement schedule, the physical environment or (more likely) combinations of these and other unidentified variables.

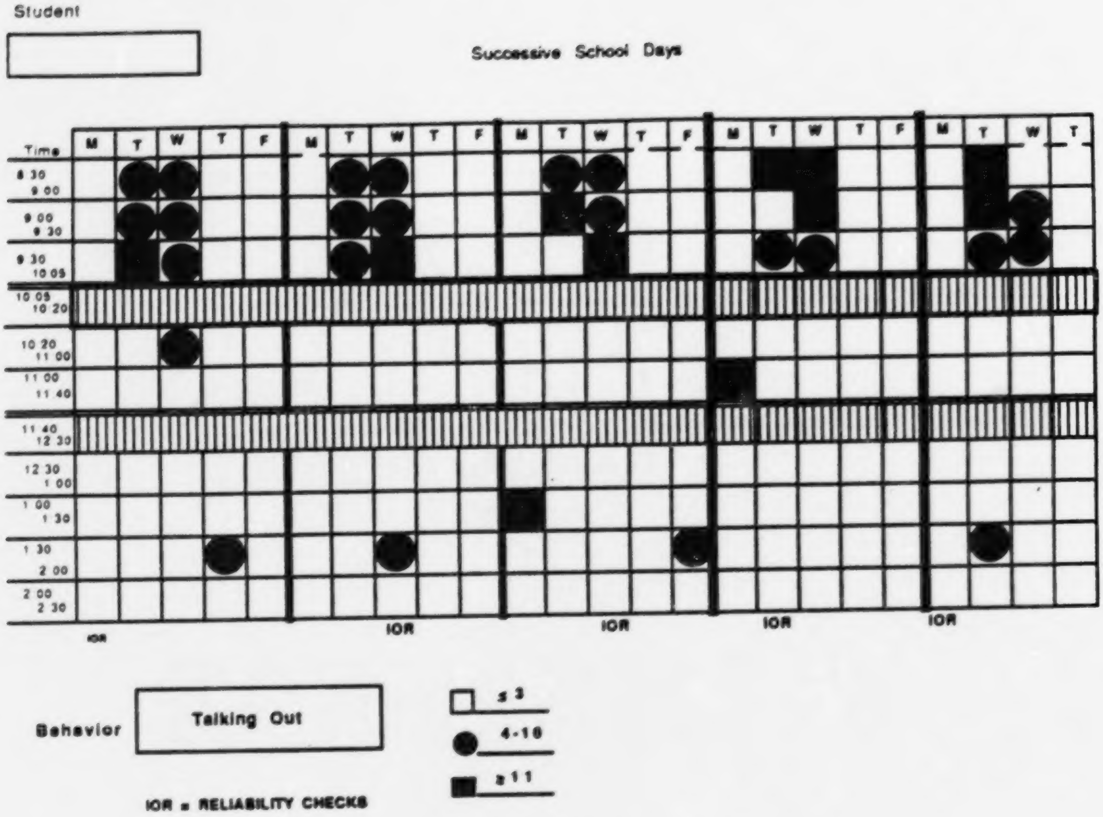

Figure 1. Sample scatter plot with hypothetical data. Open squares represent a rate of less than 3 talk outs during that interval. Shaded circles indicate occurrences ranging from 4-10 per interval. Filled squares reflect 11 or more occurrences of talking out during that interval.

The sample scatter plot's hypothetical data reveal clear patterns of talking out (see Figure 1). It occured most frequently on Tuesday and Wednesday mornings between 8:30 and 10:05. This assessment information could be used in a number of ways by practioners or teaching personnel to examine curricular or schedule variables associated with the observed high rates. For example, the time periods associated with high frequencies may have been during group oriented Language Arts activities. Empty cells during the same time periods (8:30 to 10:05) but on different days (Monday, Thursday, and Friday), while also associated with Language Arts, may be predominantly individually oriented activities. Based on this information, the teacher could either make schedule changes for the student (i.e., from group to individual work in language arts) or conduct a more detailed assessment. Further assessment could discretely focus on the time periods and activities identified as setting the occasion for high rates of problem behavior. Thus the scatter plot can be used to collect functional assessment data to empirically guide broad schedule or curricular changes or it can be used as a preliminary assessment device to guide more discrete experimental analyses. In both cases, some of the "guess work" of assessment is eliminated (Brown, 1991).

Reliability

Prior to beginning the study, competency in staff recording was established. The researcher spent a minimum of two full school days in each class independently recording the target behaviors while staff was instructed to do the same. At each break in the day (i.e., recess, lunch, dismissal), recording forms were compared between the researcher and the teacher in Classroom 1 and between the researcher and the teacher and aide in Classroom 2. Discrepancies were reviewed and practice recording continued until reliable observations were obtained (at least 80% agreement).

Once accuracy was established, inter–observer reliability probes were conducted by the researcher on a minimum of 20% of all school days for each subject across the duration of the study. The researcher seated himself unobtrusively in each classroom and independently recorded the target behaviors. At the end of the day, the researcher compared his frequency counts with those of the teaching staff. Reliability coefficients were calculated by dividing agreements by agreement plus disagreements x 100. Agreements were considered to have occurred if both observers recorded the behavior as occurring in the same rate category (i.e., agreed to score interval with either an empty square, shaded circle, or shaded square).

Independent Variables

The independent variable for each subject consisted of an intervention technique (i.e., program change) that attempted to manipulate an element in the child's classroom environment which tended to be associated with or set the occasion for occurrences of the target behavior. For example, it might be shown that an unstructured group activity sets the occasion for a specific problem behavior. Subsequently the structure of the group activity would be modified. Data was collected daily by the teachers and aides and the schedule/activity revisions were evaluated weekly by the researcher and the teaching staff. Further revisions were made based on (a) extreme increases in aberrant behavior (relative to "baseline") or (b) no change in the observed rate of the target behavior after a minimum of one week.

Changes were based on "hypotheses" derived from the teacher's collected observational data. Hypotheses refer to statements about functional relations between behavior and the environment (specifically causal statements). Hypotheses were generated by visually inspecting the student's scatter plot. Following each reliability visit by the researcher, (approximately once per week for both classrooms) team meetings were held between the teacher, assistant, and researcher to develop hypotheses about variables possibly controlling the high frequencies of recorded problem behavior. Only one time interval per student was targeted for intervention. Data, however was collected throughout the day to determine (a) the effect of the intervention during that specific time interval and (b) the effect, if any, of the intervention throughout the school day. Since no agreed-upon standard of hypothesis formation exists in the literature, a preliminary set of guidelines was introduced by the researcher. Three primary sources were used to develop the guidelines (Axelrod, 1987; Bailey, cited in Axelrod, 1987; Donnellan, Mirenda, Mesaros, & Fassbender, 1984). The aim was to develop specific questions to ask when visually analysing the scatter plot (see Table 3). The target behavior was initially evaluated by visually inspecting the student's scatter plot for any trends in frequency across time. Once a trend was identified, the behavior was further considered in the context of the classroom environment by using the functional assessment guidelines. For example, was the target behavior "talking out of turn" occurring during a structured or unstructured activity?; what was the duration of the activity?; and could the behavior be a side effect of medication?

Insert Table 3 about here

Answers to the questions suggested possible controlling environmental variables. It may be found that unstructured activities were associated with high rates of talking out. Further, it may be hypothesised that unstructured activities set the occasion for talking out and that removal of unstructured activities from the student's timetable will decrease the rate of talking out. The hypothesis could then be tested by changing the nature of the activity (e.g., introduce structure). To check the accuracy of the hypotheses, the target behavior is continuously recorded and plotted. Patterns on the scatter plot reflect whether the rate of talking out is decreasing, increasing, or, staying the same.

Design

A single subject pre-experimental A-B design across subjects was used in the study (Kazdin, 1981; Tawney & Gast,1984). The design was used to continuously monitor the student's behavior during baseline and intervention conditions. Baseline data (A phase) was collected continuously for each subject during the academic portion of the student's day in the BMC. Data collection continued until trends were evident in the scatter plots. When it was agreed upon at a team meeting between teacher, aide, and researcher that a target behavior was occurring consistently across a time interval, a program change was designed and implemented for that interval by following the previously mentioned guidelines to generate a hypothesis (B phase).

Table 3

Functional Assessment Guidelines

Step 1

Identify a behavior of interest: ____________________

Step 2

Antecedent Event Inventory

I)

1- nature of instruction
2- nature of the activity
3- number of students
4- behavior of the other students
5- length of the activity
6- sudden changes in activity or environment
7- behavior of others towards student
8- recent changes at home

II)

1- Are there circumstances in which the behavior always occurs or never occurs?
2- Could the student be signalling a physiological deprivation such as hunger?
3. Could the behavior be a side effect of medication?
4- Does the behavior only occur with certain people?
5- Could the student perform the behavior to:
    a) escape the situation
    b) compete with boredom
    c) gain attention

Step 3

Form hypotheses regarding controlling environmental variables.

Step 4

Test hypotheses by changing antecedents based on answers to the above questions.

Step 5

Does frequency of behavior decrease over time according to the scatter plot:

If no, hypotheses not supported, continue assessment and return to Step 2.
If yes, hypotheses supported. Continue assessment for maintenance/generalisation.

Following a program revision (e.g., change in activities or tasks) daily data collection and weekly team meetings continued as in baseline. The scatter plots were updated weekly by the researcher to evaluate the behavior change.

Social Validity

To assess the teaching staffs' perceptions of the scatter plot's effectiveness in this study, a questionnaire was developed and administered (see Appendix 4). Specific questions related to (a) the effects of recording student behavior and (b) the usefulness of the scatter plot. The questionnaires were completed independently and returned separately by the four teaching staff participating in this study.

Summary

In summary, an AB single subject design was used across four male students placed in two different special education classrooms for children with behavior disorders. Frequency counts were collected daily for approximately 3 months. Reliability checks were conducted on a minimum of 20% of the school days across the duration of the study.

The frequency data were displayed on a scatter plot. The scatter plot was used to differentiate frequencies into categories of rate. High, medium, and low rates of problem behavior were visually identified on the scatter plots as shaded squares, shaded circles, and empty squares, respectively. A pattern or trend would be considered to occur if several days data revealed that shaded squares, for example, consistently appeared during a) certain days, b) certain time intervals, or c) some combination of the two. The trends were used to form hypotheses. These hypotheses were used to guide functional interventions to reduce problem rates of behavior. Each intervention was specific to the 30 minute time interval associated with patterns of problem rates of behavior.

In the following chapter, results are presented for the a) reliablity checks, b) effects of the intervention for the specified target interval, c) effects of the intervention in the context of the entire school day, and d) staff responses to the questionnaire.

CHAPTER IV

Results

Introduction

The purpose of this field study was to investigate the scatter plot method of displaying observational data to assist in program planning for four students considered behavior disordered. The major dependent variable evaluated was a frequency count of a specified target problem behavior per interval of time for each student (i.e., rate). Baseline and intervention data were collected for 3 months via direct observation by the teaching staff during the academic portion of the student's school day (approximately 4.5 hours per day). Results for each student are presented in this chapter including (a) baseline frequency of the target behavior during the target interval and across the school day, (b) the hypothesis regarding the controlling variable(s), and (c) the changes in the frequency of behavior following intervention during both the target interval and across the school day. In addition, the responses by the teaching staff to the social validity questionnaire are presented.

It is important to note that the line graphs for all students were constructed at the end of the study. Only the scatter plots were used to display the frequency of target behaviors during the course of the study. Upon completion of the research, line graphs were constructed to assist in a more comprehensive analysis of the effects of the interventions. Consequently, the data contained in the line graphs were unavailable to the researcher and teaching staff. Implications of this approach are discussed in detail in Chapter 5.

Reliability

Reliability was calculated by dividing number of agreements by agreements plus disagreements x 100. Overall reliability was 92.0%. Individual coefficients were as follows,

Subject 1: Mean= 90.5 %, range 75 to 100%
Subject 2: Mean= 97.5 %, range 90 to 100%
Subject 3: Mean= 95.0 %, range 89 to 100%
Subject 4: Mean= 85.0 %, range 67 to 100%

Visual Analysis of Scatter Plot Data

Student One

Baseline. Frequency counts were plotted on T's scatter plot to see if any environmental events might reliably be associated with occurrences of talking out of turn. A time-out procedure was in effect for this and other problem behaviors within the classroom throughout the study. The data was collected during the academic portion of his day in the BMC including line-up time. No data was collected when the student was in time-out.

T's talking out of turn during week 1 and 2 occurred at a high rate (i.e., predominantly shaded circles and squares). Initially, it was noted in week 1 and 2 that the first interval in the morning (8:30 - 9:00) and again after recess (10:30 - 11:00) were regularly associated with T's target behavior (see Figures 2 and 3). An intervention (i.e., program revision) was suggested but not implemented because it was known that T would begin medication the following week. T began medication in week 3 (Ritalin, 5 mg.). Visual analysis of week 3 suggested an immediate decrease in rate of talking out. Assessment continued with week 4 seeing the addition of a new student in the BMC. Observation and recording was maintained to see if (a) the new student would effect the rate of T's target behavior and (b) the trend between 8:30 - 9:00 A.M. would continue. It should be noted that, concomitant with the above changes, T's time spent in integration was slowly increasing.

Insert Figures 2, 3, and 4 about here

Over 5.5 weeks of baseline the percentage of 8:30 to 9:00 A.M. target intervals containing problem rates of behavior was 13/23 or 56%. The raw frequency of occurrences of talking out between 8:30 and 9:00 ranged from 14 to 37 (M= 21). The overall number of occurrences of T talking out of turn during baseline conditions ranged from 3 to 112 (M= 29/day). Talking out occurred in 103 of approximately 220 half-hour intervals (47%). The target behavior during baseline (and intervention) is presented via a scatter plot in Figure 2 and displayed replotted onto line graphs in Figures 3 and 4.

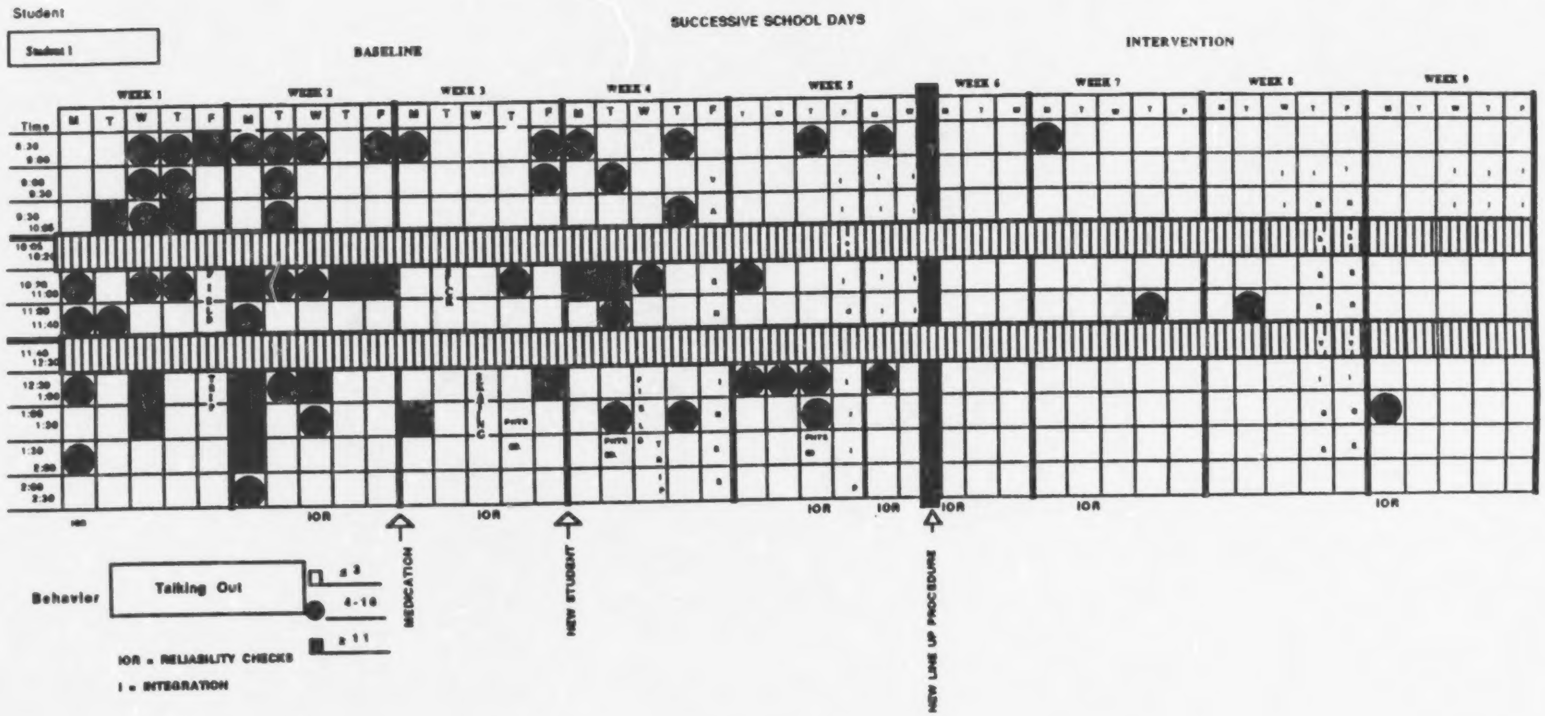

Figure 2. Student 1's scatter plot with talk outs plotted across time. Open squares represent a rate of less than 3. Shaded circles indicate occurrences ranging from 4-10 per interval. Filled squares reflect 11 or more occurrences of talking out during that interval.

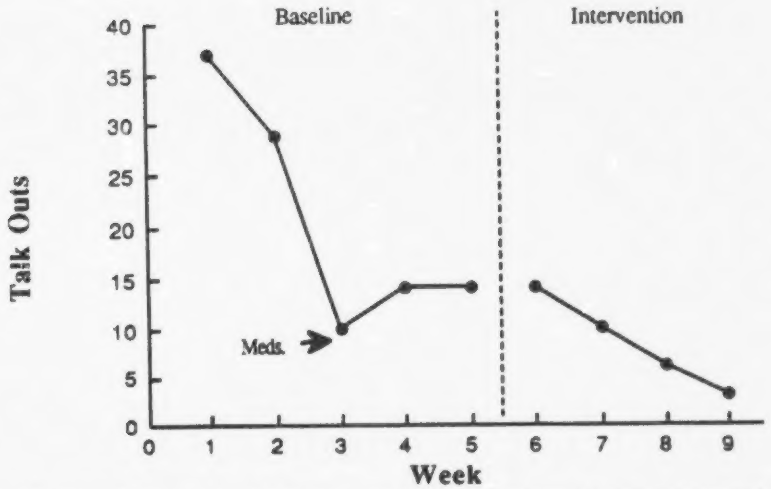

Figure 3. Raw frequency of occurences during Student 1's target interval (8:30-9:00 A.M.)

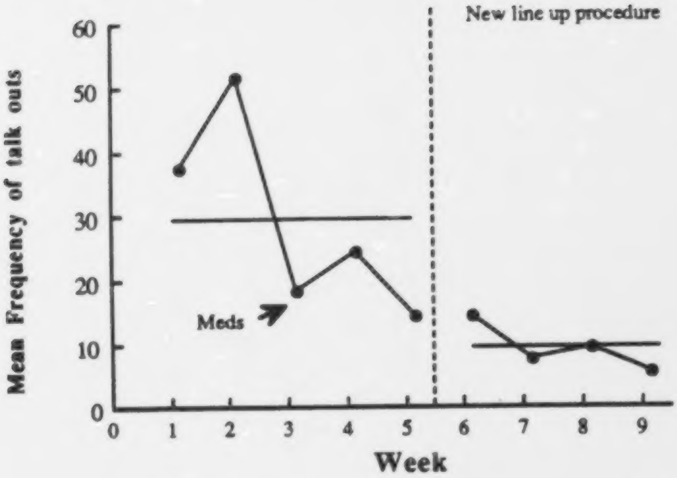

Figure 4. Student 1's weekly mean frequency of talk outs.

Hypothesis. After 5.5 weeks of continuous baseline data collection it was agreed upon at a team meeting between teacher, aide, and researcher that, according to the scatter plot, talking out seemed more probable first period in the morning (8:30 - 9:00) and again first period after recess (10:20 - 11:00). Further, it was agreed that the morning interval would be better suited for intervention rather than the afternoon given that (a) it would be a good way to start the day, (b) there was more structure present with classroom routines clearly established. As well, anecdotal remarks from both teacher and aide and direct observation by the researcher suggested that the line-up procedure preceding the first morning period was an an area of concern. While its intent was to organize the class it seemed, rather, to produce the opposite effect, (i.e., student disorder escalated). The guidelines (previously described in Table 3) were used to facilitate hypotheses about controlling antecedent variables and subsequently guide the intervention. Environmental antecedents considered salient for student 1 within the context of the line up time are summarized in Table 4. They included the number of other students (several others during line up), the behavior of other students (disruptive, loud), behaviors of others towards target student (sometimes antagonizing, distracting, and provocative), sudden changes in environment (coming in first thing in the morning) and attention seeking.

Insert Table 4 about here

Intervention. The intervention consisted of manipulating one aspect of the morning routines --the line-up procedure. The regular line-up procedure remained in effect during the three other transition times throughout the day (i.e., after morning recess, after lunch, and prior to home time). The typical line-up procedure involved both the teacher and aide meeting the students at a designated outside entrance, accompanying them up the stairs, monitoring lockers, and finally having the students line up underneath their name tags against the wall opposite their lockers (just outside their classroom). As mentioned, the

Table 4

Salient Antecedent Events* During First Morning Interval for Student 1.

Context

I

3- the number of other students
4- behavior of other students
6- sudden changes in environment
7- behaviors of others towards student

II

5- a) gain attention

Hypothesis

Student 1's talking out of turn between 8:30 and 9:00 A.M. was a function of the morning line-up routine. Lining up could therefore be modified to reduce the frequency of talk outs.

---

*from Table 3; Functional Assessment Guidelines

procedure was to give the teacher and aide opportunities for greetings, encouragement (e.g., "Let's have a good day!") and general announcements.

The line-up procedure was restructured as follows. Upon entering the school, the assistant met the students at the outside entrance and sent each student up one at a time at approximately 3 minute intervals (i.e., she temporally and physically separated them). The teacher, waiting upstairs in the hallway outside the classroom, would greet each student as he came through the doors into the hallway. This provided an opportunity for a brief moment of individual attention (e.g., "Nice to see you today. You look great! Ready to have a really good day? I am!"). It also ensured that locker duties (e.g., hanging up coat) were completed. Each student was then either sent into the classroom with the morning task clearly described for them or to their respective integration class.

Visual inspection of the scatter plot following the implementation of the new line-up procedure revealed a clear reduction in T's talking out during the first morning interval (8:30 - 9:00) (see Figure 2). The number of first morning intervals across the baseline condition with a recorded "problem" rate (either a shaded circle or square) was 13/23 or 56%. Following program revision, the ratio of intervals containing moderate to high rates (i.e., filled in circles or squares) dramatically decreased to 1/18 or 5% of the observed intervals. As well, the total occurrences of talk outs between 8:30 and 9:00 declined following intervention (from 3 to 14 , mean = 8) (see Figure 3).

In addition, the overall number of incidents of talking out during the entire recording interval also declined. Total incidents of talking out ranged from 0 to 20 (M= 7) per day over the 4 weeks of intervention conditions. Talking out occurred in 51 of the approximately 160 half-hour intervals (32%).

The program change of temporally and physically spacing the students had a clear effect on the rate of T's talking out. As an antecedent manipulation, the conditions were changed to make the problem behavior less probable while, at the same time, positive behaviors would become more probable. Essentially the intervention set the occasion for non-problem behaviors to occur by eliminating the opportunity for their development. This was done by switching from a group to an individual line up routine.

Student Two

Baseline. Observational data for R was collected and graphed via the scatter plot to determine if incidents of talking out were under clear stimulus control. The data was recorded over the course of his academic day in the BMC and during line-up time. As with Student 1, a time-out procedure was in effect for this and other behaviors throughout the study. Again, no data was collected when R was placed in time-out.

R's baseline rate of talking out, as revealed by the scatter plot, appeared greatest when entering the classroom following arrival at school in the morning (8:30 - 9:00) and again when entering the classroom after morning recess (10:20 - 11:00). Three continuous weeks of recording suggested that these time intervals were most frequently associated with high rates of talking out. However, rather than introduce a program change in week 4, daily observation and recording continued because a new student was welcomed into the classroom. Baseline conditions were maintained to see if the additional student would have any effect on R's rate of talking out. Weeks 5 and 6 revealed that (a) the rate of talking out during the first interval in the morning increased and (b) the rate of talking out in the first interval following recess decreased.

During baseline conditions; the number of target intervals (8:30 - 9:00) containing problem rates of behavior were 14/26 or 54%; the raw frequency of occurrences between 8:30 to 9:00 ranged from 14 to 53 (M= 33); and the total occurrences of talking out ranged from 7 to 74 (M= 29) per day. Overall incidents of talking out occurred in 117 of the approximately 230 30 minute intervals (51%). Figure 5 presents the R's data on a scatter plot while Figures 6 and 7 display typical frequency line graphs of the same data.

Insert figures 5, 6, and 7 about here

Hypothesis. An intervention was planned for the first time interval following the morning routines (8:30 - 9:00). The proposed guidelines were considered with attention

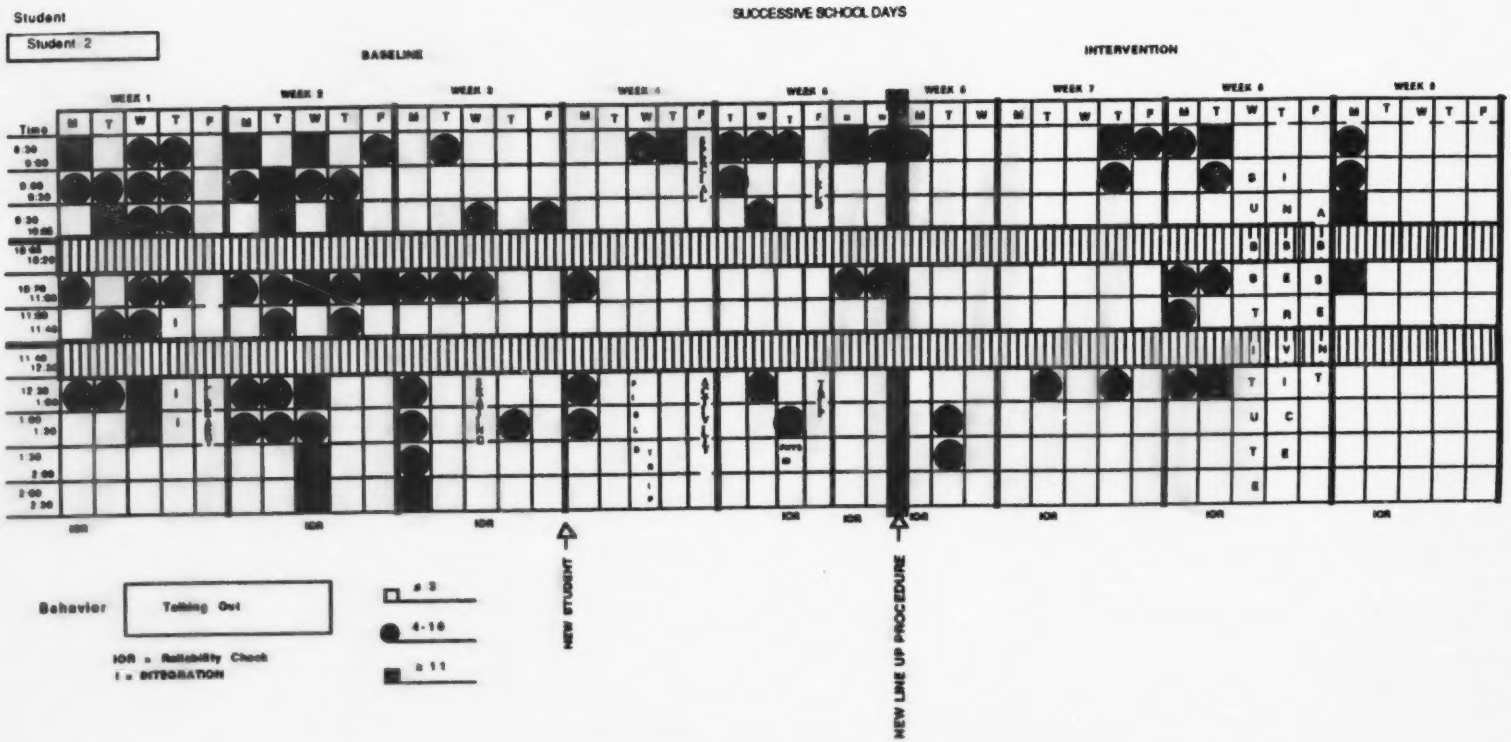

Figure 5. Student 2's data configured on a scatter plot. Empty cells reflect a rate of 3 talk outs or less for that interval. Shaded circles indicate between 4 to 10 occurrences of talking out. Filled cells represent 11 or more occurrences for that interval.

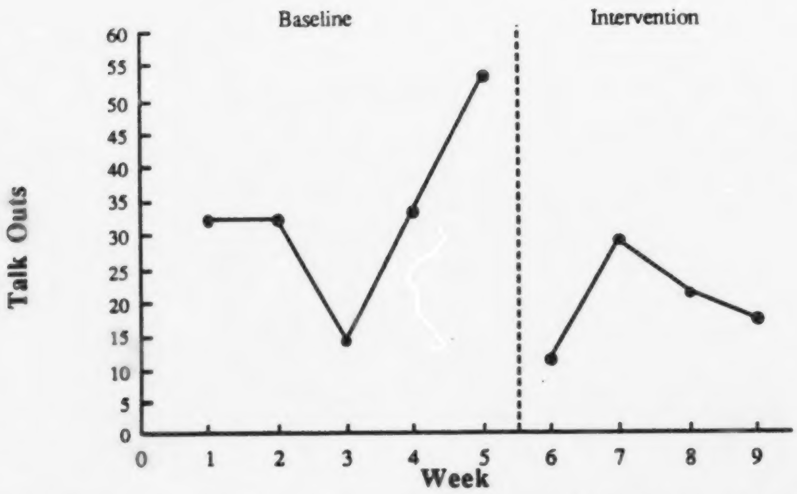

Figure 6. Raw frequency of occurrences during Student 2's target interval (8:30-9:00 A.M.).

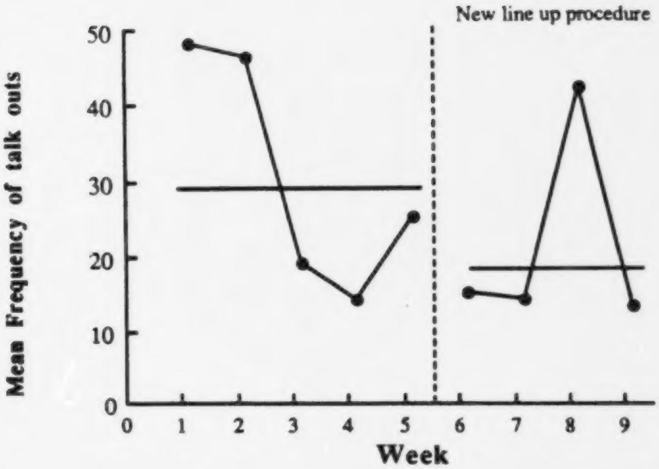

Figure 7. Student 2's weekly mean frequency of talk outs.

given to a number of antecedent variables including the number of other students present (several during line up time preceding first morning interval), the behavior of other students (can be loud and distracting, compete with teacher or aide for attention), sudden changes in activity or environment (coming in first thing in the morning), behavior of others toward student (occasionally provocative), and attention seeking. Table 5 summarizes the salient antecedent events considered for Student 2.

Insert Table 5 about here

Intervention. The program change for Student 2 was identical to Student 1's (i.e., a classwide line-up revision). Details of the procedure may be found above. Visual inspection of R's scatter plot following intervention suggests a positive reduction in the rate of R's talking out between 8:30 and 9:00 A.M. (i.e., fewer shaded circles and squares). The number of targeted morning intervals across the baseline condition with recorded problem rates (i.e., either a shaded circle or square) were 14/26 or 54%. Following program revision, the ratio of intervals containing moderate to high rates of problem behavior decreased to 6/18 or 33% of the observed intervals (see Figure 5). During intervention, the number of occurrences of talking out decline during the target interval ranging from 11 to 29 (M=20) (see Figure 6).

Again, overall declines in taking out were noted for the entire school day. Post line-up revision occurrences of talking out ranged from 0 to 49 (M=13) per day with overall incidents occurring in 39 of 150 approximately thirty minute intervals (26%) (see Fgure 7).

Student Three

Baseline. A step chart (see Classroom description section in Chapter 3) and time-out procedure was in effect for Student 3 throughout the length of the study. The data was collected throughout the portion the academic day that B was in the BMC classroom.

B's scatter plot data were used to try and identify environmental events associated with his inappropriate declarations about events or people It was noted that (a) his inappropriate comments were associated with transition times and (b) appeared to reliably

Table 5

Salient Antecedent Events* During First Morning Interval for Student 2.

Context

I

3- the number of other students
4- behavior of other students
6- sudden changes in environment
7- behaviors of others towards student

II

5- a) gain attention

Hypothesis

Student 2's talking out of turn between 8:30 and 9:00 A.M. was a function of the morning line-up routine. Lining up could therefore be modified to reduce the frequency of talk outs.

---

*from Table 3; Functional Assessment Guidelines

occur when entering the classroom after morning recess (10:30 - 11:00). It was also observed that the larger block of time between morning recess and lunch occasioned many instances of the target behavior (10:30 - 12:00).

During the 4 weeks of initial baseline observations, problem rates of behavior occurred in 100% (16/16) of the time intervals between 10:30 -11:00 with raw frequencies of occurrences ranging from 4 to 8 (M=6). The overall number of inappropriate comments ranged from 4 to 23 (M= 13) per day over four weeks of baseline observations. Inappropriate declarations occurred in 79 of the approximately 160 half–hour intervals (49%). A scatter plot of B's data during baseline (and intervention) is presented in Figure 8. Figures 9 and 10 present the same data via line graphs.

Insert Figures 8, 9, and 10 about here

Hypothesis. The hypothesis underlying the proposed program change was derived through a team meeting between the teacher, aide, and researcher. It was agreed upon that the most obvious and consistent trend in rude remarks was in the interval after morning recess (10:30 - 11:00). Staff anticipated that if conditions could be altered to change an antecedent event in the first interval after morning recess, the opportunity to make rude or inappropriate comments might be reduced in this interval. The guidelines, as outlined in the previous chapter, were followed and the salient antecedent events are summarized in Table 6. Environmental events and contextual conditions considered included, attention seeking (emitting the inappropriate statements to gain attention from staff or peers), nature of the instruction (the students waited for the teacher to return to the classroom before beginning any math tasks), behavior of other students (while waiting for instruction, could become loud and disruptive), behavior of others toward student (while waiting for instruction, sometimes provoked student 3) and a sudden change in activity or environment (coming in from recess).

Insert Table 6 about here

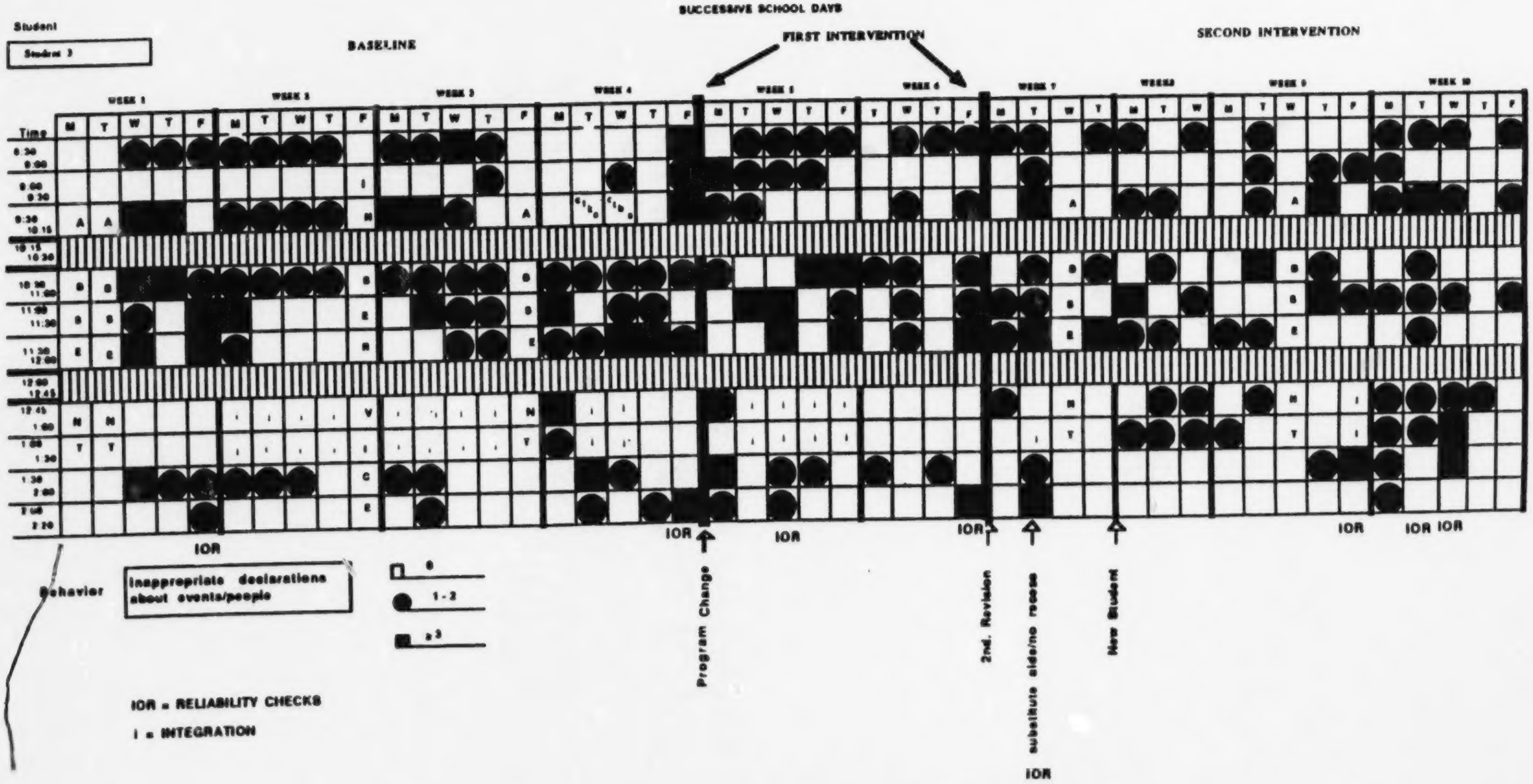

Figure. 8. Student 3's scatter plot with inappropiate declarations plotted across time. Open squares indicate no occurences. Shaded circles represent occurences ranging from 1-2. Filled squares reflect 3 or more occurences of inappropriate declarations for that interval.

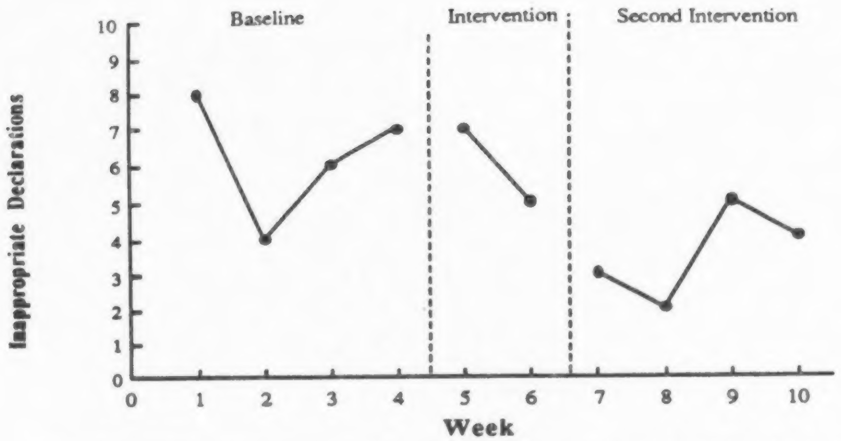

Figure 9. Raw frequency of occurrences during Student 3's target interval (10:30-11:00 A.M.).

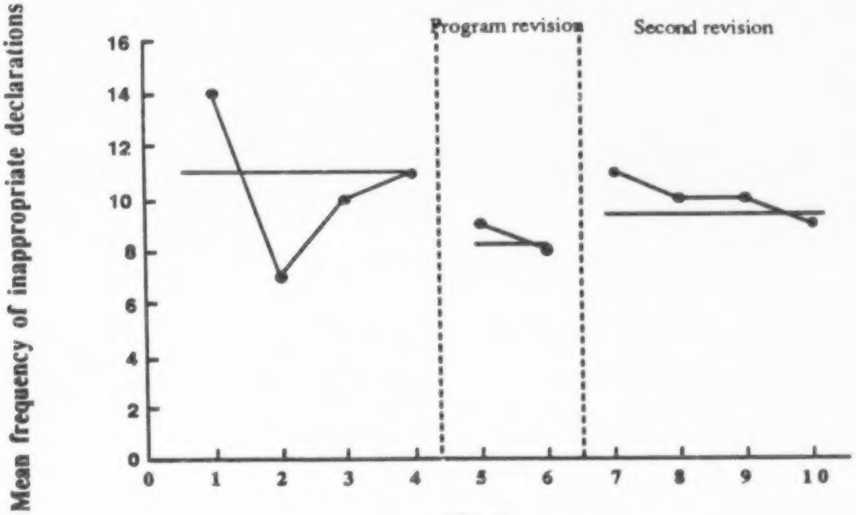

Figure 10. Student 3's overall mean frequency of inappropriate declarations.

Table 6

Salient Antecedent Events* Prior to First Interval after Recess for Student 3.

Context

I

1- nature of instruction

4- behavior of other students

6- sudden changes in environment

7- behaviors of others towards student

II

5- a) gain attention

Hypothesis

Student 3's inappropriate declarations about events and people were a function of a sudden change in environment (i.e., coming into the classroom from recess) and waiting for teacher instruction in Math. Conditions could therefore be altered upon entry into the classroom to reduce the rate of student 3's inappropriate remarks..

*from Table 3; Functional Assessment Guidelines

Intervention. A program change was implemented after four continuous weeks of baseline observing and recording. The program revisions for B consisted of providing more task/activity structure in the interval immediately following morning recess. The typical routine during this interval consisted of math activities. The students were to enter the room and quietly wait for the teacher to begin the lesson introduction or go over previous day's work. The "down time" for B between entering the classroom from recess and waiting for the teacher appeared to set the occasion for the occurrence of inappropriate vocal behavior.

The initial change to B's routine (and the rest of the class as well) consisted of placing a small but visible worksheet of math questions on his desk that he would have immediate access to upon entering the room. B was verbally prompted prior to leaving for recess that after recess he should come in, sit at his desk, and complete the math sheet. It had been suggested by both the assistant and the teacher that once he became engaged in a task he would work diligently and quietly. In essence, this procedure was introduced to provide more structure and lessen the opportunities for B to emit inconsiderate remarks.

Problem rates of behavior occurred in 6 of the 9 or 66% of target intervals (10:30 - 11:00) in the first intervention condition (see Figure 6). Overall incidents of inappropriate comments ranged from 3 to 17 (M= 8.7) per day during the first intervention condition (see Figure 8). Inappropriate declarations occurred in 39 of the approximately 90 half–hour intervals (43%). Visual inspection after two weeks of the initial program change suggested that the modified Math routine had had a positive effect on the number of occurrences of T's target behavior between 10:30 and 11:00 (i.e., a reduction). However, a second revision was planned to further reduce occurrences of problem behavior.

The second program revision was implemented for four weeks. The math worksheet procedure continued but was introduced via a more immediate and perhaps more salient method. It was reported by the teacher and the assistant that B's statements began the moment he entered the classroom. Thus, a "mailbox" for each student was set up by the classroom entrance. The math worksheet was placed in B's mailbox prior to recess and was to be picked up when entering the room enroute to his desk. It was expected that this might further reduce opportunities for inappropriate declarations. During the second intervention, problem behavior ranged from 2 to 5 (M=4) raw occurrences per thirty minute target interval (see Figure 7). A count of the target intervals (10:30 - 11:00) across the second intervention revealed that problem rates of target behavior had occurred in 40% of the intervals (6/15) (see Figure 6). Furthermore, a count of the target interval across both intervention conditions does, in fact, reveal a 50% reduction in problem rate (i.e., shaded circle or square) during the first 30 minute interval following recess (16/16 or 100% of intervals v.s. 12/24 or 50% of intervals containing a shaded circle or square). It would appear that, for the target interval, the intervention was effective.

The total number of inappropriate comments during the second intervention condition (four weeks) ranged from 2 to 19 per day (M=9.8) and occurred in 76 of the 150 approximately half hour intervals (51%). These results, in effect, are showing an increase (albeit small) in the target behavior's mean overall frequency of occurrence following the second revision. Although still occurring less than original baseline levels, the target behavior showed an overall increase across the school day rather than a decrease relative to the initial program revision.

The negligible decrease in overall rate suggests that the number of other time intervals associated with B's target behavior were increasing, (i.e., there must be an increase at other times in order for the overall rate to remain virtually unchanged). Visual inspection of his scatter plot provides supporting evidence. During baseline, B spent a large portion of his afternoons in integration. However, after the math activity revision, particularly after the second revision, B's integration time is noticeably reduced while the frequency of rude remarks has clearly increased. Specific reasons for the reduction in integration time are unknown to the researcher. It is likely that, for various reasons, B was consistently unsuccessful at getting to the required "step" to gain access to integration.

Student Four

Baseline. Because of a dramatic reduction in J's rate of noncompliance following the first week of observation no program changes were made. Observational data collected on J was plotted on the scatter diagram to see if any stable or consistent trends would emerge with regard to instances of noncompliance. The data was collected throughout J's school day when he was located in the BMC classroom. As with Student 3, a step chart and time-out procedure were in effect throughout the length of the study.

The total number of incidents of noncompliance ranged from 4 to 31 per day (M=16.4) during the first week of data collection. Noncompliance occurred in 35 of the approximately 50 half–hour intervals (70%). Over the following ten weeks of data collection the number of incidents of noncompliance ranged from 0 to 19 per day (M=3.2). Noncompliance occurred in 65 of the 410 approximately half hour intervals (16 %). A scatter plot of J's data is presented in Figure 11 while Figure 12 offers the same date replotted on a line graph.

Insert Figures 11 and 12 about here

The immediate observation, clearly evident from visually inspecting both the line graph and scatter plot, is the dramatic reduction in rate of noncompliance. The first week of data collection took place during December, the second week prior to the Christmas break. The formal data collected via direct observation and anecdotal remarks by the teacher, aide, and researcher suggested that the "festive season" was having a negative effect on J. Several instances of noncompliance occurred during seasonal activities (e.g., decorating the room, working on a Christmas story).

Following J's return from Christmas break, the rate of noncompliance approached zero across weeks one and two. Data collection continued to see if the observations were reflecting a transient "honeymoon" period (i.e., a dramatic stimulus change suppressing the behavior of interest). This, however was not the case. While J had his occasional "bad" days over the ensuing seven weeks, his noncompliant behavior ceased to be a problem and no intervention was deemed necessary.

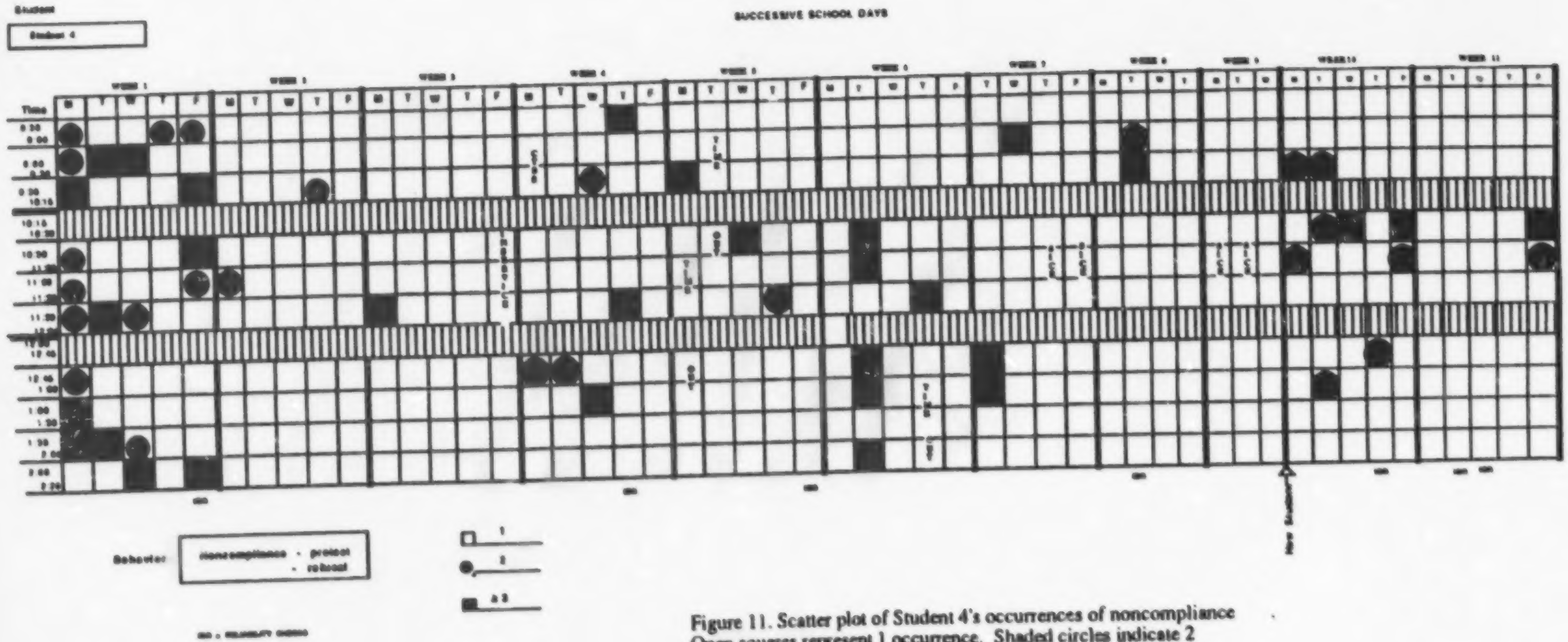

Figure 11. Scatter plot of Student 4's occurrences of noncompliance . Open squares represent 1 occurrence. Shaded circles indicate 2 occurrences. Filled squares reflect 3 or more occurrences of noncompliance for that interval.

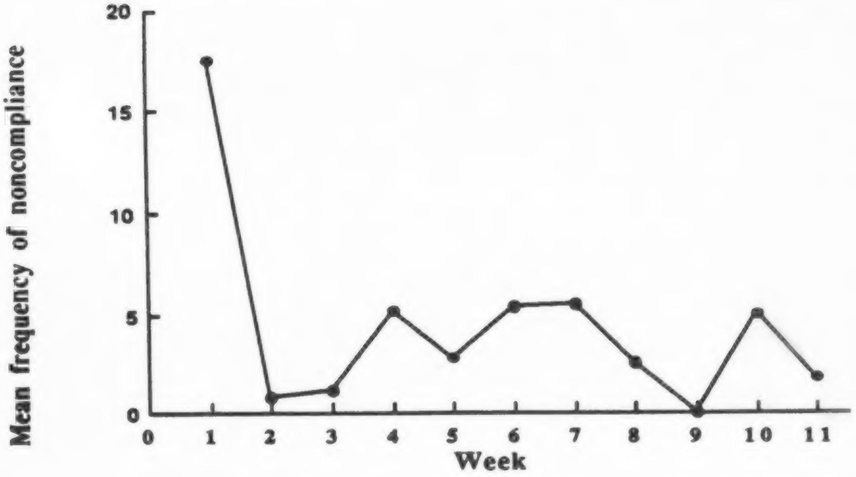

Figure 12. Student 4's overall mean frequency of noncompliance.

Summary of Scatter Plot Assessments

In summary, results suggest that the scatter plot assessments were effective in guiding interventions to reduce high frequencies of problem behavior in elementary students described as behavior disordered. The specific time intervals associated with high rates of target behaviors show clear reductions for the three students who received intervention (see Figure 13).

Insert Figure 13 about here.

Overall reductions across the school day were also evident for Students 1 and 2, but not Student 3. These data are discussed further in the following chapter.

Summary of Staff Responses to Scatter Plot Questionnaire

Upon completion of the study, a questionnaire was given to the four teaching staff involved in the project. The data presented are summarized from the original responses. Complete answers from all respondents are available in Appendix 5.

In general, the staff became more aware of the times in which the respective target behaviors were occurring. Staff, however, were divided regarding the effect of recording student behavior on the student's themselves. In classroom 1 it was felt that the two students were not aware they were being recorded while staff in classroom 2 suggested that both their target students were aware of being recorded. The aide in class 2 reported that this awareness contributed to the reduction in target behavior. All staff, however, agreed that the researcher's presence during reliability checks had no effect on student behavior.

Regarding the procedure itself (i.e., having to observe and record specific behaviors), all staff felt that this was relatively easy, and that by plotting the behavior on the scatter plot, the students involved became easier to plan for. The scatter plot allowed the staff to focus on the time and conditions occurring prior to the occurrences of high rates of the identified problem behaviors. Finally, everyone suggested they would use the procedure again with a cautionary note regarding a limit on the number of students to monitor. No respondents made any mention of how the procedure might be changed or

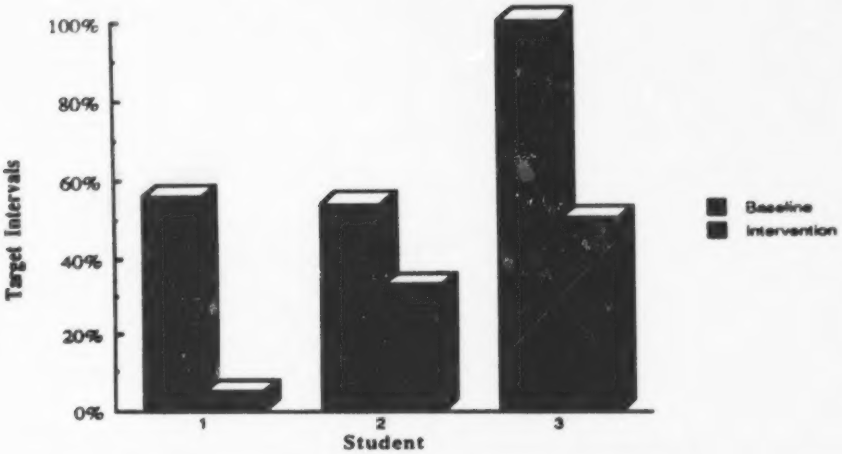

Figure 13. Percentage of target intervals containing occurrences of problem behavior.

improved. In general the questionnaire results suggest that the procedure was considered by special education teaching staff to be easy to use and beneficial when planning program changes for students exhibiting problem behavior.

General Summary

The overall results suggest several important and related findings. For the particular specified time intervals, the scatter plot was effective in assessing environmental correlates of problem behavior. This led to successful functional interventions for three of the four students. Pre-intervention conditions were maintained throughout the study for Student 4 as his problem behavior declined coincident with the onset of the study.

For Students 1 and 2, interventions planned for specific time periods appeared to have broad effects across the entire school day. Specifically, their line-up procedure was altered in the morning, while the standard routine was kept during other transition periods. Rates of talking out, however, showed an overall decline across the school day. No such generalized effect on problem behavior was observed for Student 3. Results of the staff questionnaire suggest that the procedure was considered by special education teaching staff to be easy to use and beneficial when planning program changes for students exhibiting problem behavior.

In the final chapter results are discussed. Particular attention is given to future research concerning functional assessments and subsequent interventions, field studies, and experimental analyses. Wherever possible, the present results are contrasted and integrated with previous research findings.

CHAPTER V

DISCUSSION

Introduction

This direct observation field study evaluated the scatter plot method of functional assessment (Touchette et al., 1985). Curricular revisions were based on teacher collected frequency data for three male students identified as behavior disordered and placed in special education classrooms. The scatter plot was used to display temporal patterns in identified problem behaviors. The graphing method (as used in this study) differentiated between low, medium, and high frequencies of problem behavior per thirty minute interval (i.e., rate). The daily observations were plotted on the scatter plot and correlations were noted between time of recording and high rates of problem behavior. Subsequent visual analysis of the scatter plot was used to guide antecedent interventions to reduce problem behaviors. For comparison purposes, conventional line graphs were constructed at the conclusion of the study.

While the procedure produced only a rough representation of rate and did not identify any discrete controlling variables, results suggested the graphing method was effective in guiding programming decisions. Frequencies of problem behavior declined for three of the four participating students within the specific target intervals and for two of the four students over the entire school day. As stated by Touchette et al. (1985), the array of possible controlling stimuli may be too broad to test in uncontrolled applied settings. Thus, broad, easy to use, functional assessment methods may play an important role in initial curriculum or schedule planning for students considered emotionally disturbed or behaviorally disordered.

The present study differed from the original (Touchette et al., 1985) by using a different population exhibiting different behaviors within a different context. The original was conducted by Touchette and his colleagues in a residential treatment centre for adolescents with autism, while the present study was conducted in an elementary special education classroom for children with behavior disorders. Touchette had previously suggested that the scatter plot could be adapted to diverse settings which collect frequency data, including educational programs. However, a search and review of the literature (CD ROM; Psych. Lit., & ERIC) found no systematic attempts to apply this assessment technology within an educational setting. This is surprising as several researchers have recently discussed Touchette's scatter plot as an example of a functional assessment methodology, but doing so with no empirical support other than the original study (Axelrod, 1987; Lennox & Miltenberger, 1989; Luiselli, 1991). Additionally, a detailed description of the decision making process to develop hypotheses, not presented by Touchette, was included in the present study. As well, a questionnaire was used to gather information from the teaching staff about the scatter plot and its relative efficacy.

In this chapter, each student's problem behavior is discussed in relation to his scatter plot and line graph. Next, the discussion will focus on the efficacy of the scatter plot. The chapter continues with a discussion of the limitations encountered by the current study. The limitations addressed include (a) the research design, (b) the validity of direct observation, (c) the sample, and (d) the potential confounding variables. Finally, the implications for using (a) the scatter plot method in particular and (b) functional assessment in general are considered in relation to functional interventions, field studies, and experimental analyses. The chapter concludes with a summary and recommendations for future research.

DESCRIPTIVE ANALYSIS OF THE DATA

Intervention Results

The results of the intervention for three of the students suggest the scatter plot can effectively guide functional, antecedent, schedule changes (i.e., curricular modifications designed to remove antecedent stimuli setting the occasion for problem behavior). Frequencies of talking out of turn declined for Students 1 and 2 following a revision of their morning routine. Their class line-up procedure was restructured to temporally and physically space each of the six students prior to entering the classroom. Occurrences of talking out decreased within the specified target interval (8:30-9:00 A.M.) and over the entire day as well. For student 3, task structure was increased prior to his math period (i.e., the target interval). The frequency of his inappropriate declarations about events and other people was reduced by 50% when targeted intervals were compared across baseline and intervention conditions. Details of the student results are discussed below.

Student 1. A comparison of Figures 2, 3, 4, and 13 suggests that for Student 1 the scatter plot assessment led to a program revision that effectively reduced hius frequency of talk outs. Across baseline conditions, talking out fluctuated between high and low rates with the clearest occurrences of talking out during transitions. Following the introduction of the independent variable (i.e., the new line-up procedure), the number of occurrences of problematic rates of talking out, as depicted by a shaded circle or square, decreased substantially in the target interval (8:30-9:00). As well, there was an overall decline in the weekly mean frequency of occurrences of talking out. Both reductions maintained throughout the four weeks of intervention conditions. Two potential related confounding variables existed for Student 1; the effects of stimulant medication (Ritalin, 5 mg./day) and changes in teaching staff behavior. These are addressed in the limitations section.

Student 2. A comparison of Figures 5, 6, 7, and 13 suggests that for Student 2 the scatter plot assessment also led to an effective program revision that reduced the number of occurrences of talk outs. During the 6 school weeks of baseline, Student 2's rate of talking out fluctuated between high and low rates with the clearest occurrences of talking out of turn during transitions. Following the application of the new line-up procedure, there was an immediate drop in his weekly mean frequency of number of talk outs. This reduced rate maintained for three of the four weeks during intervention conditions. The exception was week 9. As evident on both line graphs (Figures 6 & 7) and the scatter plot (Figure 5), Student 2's rate of talking out dramatically increased for one week. Reasons for this temporary increase are not clear. It is speculated that it may have been a function of (a) his medication being altered (teaching staff alerted the researcher to this possibility although it could not be verified) or (b) the effect of approaching integration into a regular education classroom. Informal observation and staff reports suggested that Student 2's talk outs were characterized by concerns about integration, e.g., when was it going to happen, with who, for how long, and why. These reasons are, as suggested, speculative and therefore limited. Nevertheless, the week following the increase (week 10), talking out returned to previous intervention levels for both the target interval and throughout the day.

Student 3. Comparing Figures 8, 9, 10, and 13 would suggest that for Student 3 the scatter plot assessment was successful in guiding an antecedent intervention to reduce high frequencies of inappropriate declarations about others or about surrounding events between 10:30 to 11:00 A.M. The intervention, however, was relatively weak in gaining control over occurrences of rude remarks at later intervals throughout the school day. This is not surprising as the intervention or program changes were (a) limited to the academic content of that particular time interval (math) and (b) was applied to only that time interval. It would have been interesting to plan similar changes for different time intervals but using different materials (e.g., for language arts as well as math). A reduction in Student 3's target behavior during those additional times could then be convincingly attributed to the program change, or more specifically , the nature of the program change.

Student 4. The immediate observation, clearly evident from visually inspecting both Figures 11 and 12, is the dramatic reduction in number of occurrences of noncompliance following the first week of the study. The first week of data collection took place during December, prior to the Christmas break. Both formal and informal data suggested that the "festive season" was having a negative effect on Student 4. Several instances of noncompliance occurred during seasonal activities (e.g., decorating the room, working on a Christmas story).

Following Student 4's return from Christmas break, his rate of noncompliance approached zero across weeks 2 and 3. Data collection continued to see if the observations were reflecting a transient "honeymoon" period. This, however was not the case. While Student 4 had his occasional "bad" days over the ensuing seven weeks, his noncompliant behavior ceased to be a problem and no intervention was deemed necessary.

Results Related to Previous Scatter Plot Research

Previously, the scatter plot method of functional assessment was demonstrated through three case examples of adolescents and adults with autism. Operating under the assumption that undesirable behavior is functionally identical to desirable behavior, Touchette et al. (1985) illustrated how a scatter plot can facilitate the identification of relationships between problem behavior and environmental stimuli by altering subjects' schedules, activities, settings, or instructors. The patterns of behavior that emerged on the scatter plot suggested possible controlling stimuli. Inappropriate behavior was then reduced by eliminating stimuli associated with high rates of problem behavior.

Similarly, the present study demonstrated how the scatter plot could be used to identify functional relationships between curricular/schedule variables in special education classrooms and high rates of inappropriate, problematic behaviors for three elementary students with behavior disorders. For Students 1 and 2, routines associated with patterns evident on the scatter plot were changed to reduce the problem behavior. For Student 3, an academic activity was modified to eliminate the occasion for the occurrence of inappropriate behavior. No other research was located that utilized the scatter plot to plan curricular or class schedules for students considered behavior disordered.

Efficacy of Scatter Plot

Teaching Staff Concerns. The demonstrated effectiveness of the scatter plot assessment procedure along with the results of the staff questionnaire, suggested that it may be a viable and useful assessment tool for practitioners or direct service staff planning programs for the diverse needs of children exhibiting problem behaviors within a special education classroom. All staff involved reported that the tasks of observing and frequency recording, once learned, were easy and no comments suggested that it interfered with their teaching or took away from valuable resource time. Furthermore, all staff agreed that they would use such a procedure again. One important comment reported on the need to limit the number of students monitored. This is a valid concern. Indeed, even in a setting like the behavior management classrooms, not all students need be monitored (in this study, for example, the ratios were 2/6 and 2/7 for Classroom's 1 and 2, respectively). The need for a formal functional assessment utilizing a scatter plot may only arise when a problem behavior is occurring frequently and informal observations do not suggest a reliable correspondence with anything in particular.

Divisions of "Rate". The selection of values for the cells (i.e., empty or shaded depending on the frequency) was, at best, arbitrary. Essentially they were chosen by identifying rates of behavior considered problematic to the teaching staff. No empirical evidence was used to justify the criteria, for example, comparative [normative] peer data from other classrooms or data about the target students in integration settings. In the words of Touchette et al. (1985), "it is not yet clear how best to select the values for filled and empty cells" (p.351). Certainly if other values had been used, a different picture of reality would have been presented, which in turn may have lead to different interventions (or possibly no interventions). It is the opinion of this researcher that while we cannot rely exclusively on such arbitrary criteria, it seems improbable that a system could be devised for standard use across any special populations. A better question might concern magnitude of desired behavior change. For example, how much change is required for regular education integration? Answers to this could guide decisions about divisions of rate. The smaller the desired change, the narrower the rate categories should be defined to be sensitive to small shifts in frequency of occurrence following a program change.

Time Required. Another question surrounding efficacy is the length of time required by trend identification. While the staff involved felt the procedure was relatively easy to conduct (keeping in mind that these staff are not necessarily representative of all special education teachers serving children with behavior disorders), one wonders if (a) baseline observations limited to 1 or 2 weeks would be sufficient to establish patterns of problem behavior occurrence and (b) different recording systems used (e.g., momentary time sampling) would be sensitive to the gross categories of rate used by the scatter plot. It is possible that a trend or temporal pattern cannot be readily identified after 1, 2, or 3 weeks of recording. Eventually it could become a waste of time for practitioners to insist on continuous data collection by staff when data already collected is uninterpretable.

Hypothesis Development. Related to the above concern is the development of hypotheses. When visually inspecting the scatter plot what questions are the right questions to ask? What questions are going to lead to the most effective treatment? To this end, the present study developed and used a decision-making model. The model was used in conjunction with visual analysis of the scatter plot to guide program decisions. Important stimulus dimensions considered included the nature of instruction, the number of activities assigned, and physiological deprivation (for a more detailed presentation, see Table 3). Several other researchers have also proposed guidelines or decision-making models (Donnellan, 1984; Groden, 1989; Gaylord-Ross, 1980; O'Neill, Horner, Albin, Storey, & Sprague, 1990). For the time being, however, hypothesis development remains an empirical question.

Hypothesis Testing. While experimental analyses can test hypotheses about functional relations between potential controlling variables and problem behaviors, these tests can be difficult and time consuming in applied settings, although not impossible (see Dunlap et al., 1991). On the other hand, without experimental methodology it can be very difficult to state with any confidence why the intervention was effective. The primary difficulty with assessment methodology (AB design) is the limited ability of the researcher to rule out alternative explanations for any observed effects. This limitation restricts the degree to which the researcher may draw upon the findings and make valid inferences about the effectiveness of the independent variable as being the cause of the changes in the dependent variable (i.e., an internally valid study) The scatter plot, however, could certainly be used for both applied and experimental endeavours investigating stimulus control. The choice of design (e.g., A-B, withdrawal, or multiple baseline), ultimately rests with the researcher and what he or she is trying to accomplish. As stated by Baer et al. (1987) "a good design is one that answers the question convincingly" (p. 319).

Administrative Support. An issue raised by the work of Dunlap and colleagues (1991) was that of administrative support. Those in an administrative capacity may view the practice of functional assessment as time consuming and subsequent individualized programming as too labour intensive and costly. The present study offered a relatively simple alternative. While observational data were collected on individual students, subsequent schedule changes were applied for all of the students. Indeed, decisions in this regard were explicitly made at team meetings between teacher, aide, and researcher. It was decided that singling out the individual students for intervention, while possibly more effective in the short term, would ultimately not be in their best interest. That is, while the resources were available to make more intensive changes, eventually these students return to the mainstream where they will have just one teacher and twenty other classmates. In such settings, opportunities are severely limited for intensive individual intervention on the part of the teacher. Thus, the schedule changes in this study were broad-based and applied across the entire classroom with data continuously collected on the target students.

Scatter Plot v.s. the Line Graph. Over the course of the study, data were collected and visually evaluated using only the scatter plot. Touchette et al. (1985) had suggested that a conventional line graph does not offer insights into patterns of behavior. The scatter plot, on the other hand, makes potential controlling relations between environmental stimuli and behavior more apparent and therefore can facilitate functional interventions. Thus, line graphs were not constructed or used in this study until its conclusion. After the line graphs were constructed, two related problems were evident; namely, the lack of a stable baseline and changes in level within the baseline in a therapeutic direction (Tawney & Gast, 1984) (see Figures 4, 9, & 10). For Students 2 and 3 experimental control was therefore poorly demonstrated. It is likely that, if the line graphs had been used in conjunction with the scatter plots, decisions about when to intervene would have been different. The purpose of the study, however, was to demonstrate the effectiveness of the scatter plot alone, as an assessment tool. Experimental control, while greatly desired, was considered secondary.

In summary, the scatter plot as used in this study was shown to be a viable assessment instrument to guide functional interventions for three elementary students considered behavior disordered. Confounding variables in addition to weak experimental evidence restrict the conclusions that can be drawn about the effects of the interventions that were implemented. As for regular application as an assessment tool, many of the questions raised by the originally study remain (Touchette et al., 1985) including how to determine the values for filling a cell, how much time should be allocated to identify a trend, what are the "right" questions to ask when examining the scatter plot? It should be noted that the data collection process made minimal demands on the teaching staff and all involved reported they would use the scatter plot assessment procedure again. The following section examines in detail some of the above mentioned limitations.

LIMITATIONS OF THE STUDY

Design

A single subject methodology using a pre-experimental A-B design was utilized. An A–B design is not a true experimental design and, as such, inferences drawn about the causative role of the intervention are necessarily tentative and the above results should be interpreted with caution. The application of the intervention or the independent variable may cause the change, but, because the study lacks experimental control, the noted effects may be due to other extraneous variables. For example, some other specific event may have occurred simultaneously which could have produced the observed effect at the time of intervention (i.e., the threat of history to internal validity), or it might be that maturational changes within the children themselves could account for the observed changes in behavior, rather than the intervention alone (Kazdin, 1981; Tawney & Gast, 1984).

Thus, the primary difficulty with single subject A–B methodology is the limited ability of the researcher to rule out alternative explanations for any observed effects. This limitation restricts the degree to which the researcher may draw upon the findings and make valid inferences about the effectiveness of the independent variable as being the cause of the observed changes in the dependent variable.

In response to this, Kazdin (1981) has advanced a set of dimensions along which single case studies may vary. These dimensions can be used as criteria for determining the extent to which internally valid conclusions can be made from an A–B design. Cases may be evaluated along the following characteristics, objective data, continuous assessment, stability of problem, immediate and marked effects, and multiple cases. The present study will be examined with reference to these characteristics.

Type of data. In order to clearly assess whether or not change has occurred Kazdin (1981) recommended that the single subject data be objective and quantifiable rather than simple anecdotal, narrative accounts of subject behavior change. To this end, the present study's major dependent variable was a frequency count of various operationally defined, observable problem behaviors

Assessment occasions. Kazdin (1981) argued that the number of occasions for assessment will have important implications for drawing valid inferences from single case data. The choice typically lies between collecting data on a "single shot" basis (e.g., pre– and post– treatment) versus continuously over time. Data collected in a relatively brief period of time are difficult to interpret because any apparent change might be due to factors other than the intervention (e.g., effects of testing, instrumentation, statistical regression). The present study, however, utilized continuous measurement of problem behavior. Therefore, any changes as "... a function of the measurement instrument, if evident, normally would be detected prior to treatment and would not necessarily obscure the pattern of data relied on to infer changes associated with treatment."(Kazdin, 1981, p.186).

Stability of data. The extent to which valid inferences can be made is affected by our ability to make past and future projections about the dependent measure. These projections are derived from continuously recording the dependent variable (rather than "one shot" pre– and post–tests). For example, a target behavior which appears stable for a long period of time and suddenly changes with the onset of intervention suggests that the intervention may have led to the change. The scatter plot is an excellent "vehicle" for predicting. It allows you to (a) clearly see when the behavior is occurring and (b) make predictions based on apparent trends or patterns. In the present study, stable behavioral patterns in the target behaviors were evident for Student's 1, 2, and 3 following transitions in their academic routines.

Type of effect. Continuous measurement that reveals immediate and large changes as a result of intervention strengthens the degree to which causal inferences can be drawn from the data. More immediate changes rule out other likely alternative, plausible sources of extraneous influence coincident with onset of the independent variable. In a similar manner, if relatively large changes are achieved, more confidence can be afforded to the causative role of the intervention. For example, the changes recorded on the scatter plots for Students 1 and 2 were relatively large and followed immediately after the revised line up procedure. Large changes were also noted between baseline and assessment during Student 3's target interval (i.e., a 50% reduction in frequency of occurrence).

Multiple cases. Kazdin (1981) maintained that demonstrations using several cases or subjects lead to stronger inferences about the effects of treatment rather than interventions with only one subject. To this end, the present study investigated four "cases" of school children exhibiting problem behavior. Three of the cases showed change that was associated with the intervention, thus, the less likely that some extraneous event was responsible for the observed differences between baseline and intervention. Further, the changes were shown across three children of different ages and varied academic and behavioral histories, thus the inferences made are stronger than had that diversity not existed.

In summary, several of the above recommendations made by Kazdin (1981) to "strengthen" AB designs were met by the current study (e.g., type of data, assessment occasions, multiple cases). Nevertheless, without an experimental design, causal statements regarding the effects of the interventions must be interpreted with caution.

Validity Issues in Behavioral Observation

Direct behavior observation has established itself as an important assessment technique in applied behavioral research (Kratochwill, 1982). Strengths include (a) recording behavior as it occurs in its natural environment, (b) using objective (or a least impartial) observers, and (c) using behavioral definitions that do not rely on inference. The strong link between assessment and intervention is also claimed as an advantage over traditional assessment procedures (Kratochwill & Shapiro, 1984). Despite these strengths, Merrell (1989) has suggested the following concepts and practices in direct behavioral observation for careful review to ensure a high degree of validity (so we can be certain we are observing what we say we are observing). The present study will be examined with reference to these concepts and practices.

Defining the observational domain. Merrell (1989) suggested that the validity of observations can be affected by a broad versus narrow definition of the behavior being recorded. The concern is that a broad behavioral domain could include topographically similar but functionally dissimilar behaviors. The present study used narrow and specific definitions of problem behavior for each student.

Social comparison data. Data should be taken on the target behaviors in students other than the identified students to establish normative peer data. None was taken in this study since the students were already placed in a self-contained special education classroom for children with behavior disorders. It was assumed that they deviated significantly along behavioral norms for their same-age peers.

Observer reactivity. The level of observer obtrusiveness is a factor that can affect the validity of behavioral observations. Obtrusiveness (referring to the fact that the referred student is aware of the presence of the researcher) can change the student's performance simply due to this presence. Questionnaire results suggested that the researcher was unobtrusive.

Situational specificity. In behavioral assessment, it is always possible that the behavior observed in one setting does not reflect the behavior in other settings. Direct observation may not reflect anything more than that individual's behavior in the observed condition and no other. While this problem undoubtedly existed, the participating students spent the majority of their school day in only one situation, namely the BMC. Caution should therefore be exercised in drawing generalizations about inferences made regarding the effects of the program changes to settings other than the BMC.

Inappropriate recording technique. This was not considered a problem as a frequency counting procedure was the most appropriate procedure to measure the dependent variables. As suggested by Alberto and Troutman (1982), event recording is the "method of choice when the objective is to increase or decrease the number of times a student engages in a certain behavior" (p.92) Furthermore, the system of recording (frequency counts) was equivalent to the dimension used to discuss and evaluate the behavior (rate) (Merrell, 1989).

Observer reliability. Observer reliability refers to the extent to which two or more different observers similarly record the same observed behaviors. The four procedures recommended and followed included meeting as a group, practising, going over discrepancies, and reaching a set criterion (Merrell, 1989). Results of reliability checks suggest that accuracy was achieved (overall mean inter-rater reliability coefficient was

92.5%).

In summary, the method of direct observation has several criteria, which, if ignored, could reduce the validity of the behavioral recordings (Merrel, 1989). As reviewed above, the criteria for observational validity were sufficiently met by the present study. Thus, one can be reasonably confident that the collected data reflected the actual occurrences of the problem behaviors.

Sample

Two factors related to the current sample contribute to this studys' limitations. First, a sample size of four males limits the extent to which generalizations to the larger population of students with behavior disorders can be made. Secondly, the small number of elementary students placed in BMC classrooms restricts the possible subject pool for empirical research. Gaining access to such a small pool is mediated by administrative personnel. Furthermore, their decisions regarding classroom assignment to researchers may not be based on need. For example, were there other BMC classrooms in the system that could have benefitted from the research? In the present study, the selection criteria for classroom assignment remained unknown.

Potential Confounding Variables

For Student 1, confounding variables included stimulant medication and changes in staff behavior. Medication to control his hyperactivity (Ritalin, 5 mg./day) was introduced during baseline observation. The first week following onset of medication (see Figures 3 & 4, week 3) a substantial drop in weekly mean rate of talking out was clearly evident. In week 4, however, mean frequency of talk outs increased. As well, the scatter plot suggested that while overall problem rate declined with medication, talking out was still occurring frequently and, according to the teaching staff, problematically.

A change in teaching staff behavior towards Student 1 was also evident concomitant with the introduction of medication. Informal observation by the researcher suggested that staff (a) increased contingent verbal praise towards Student 1 for positive behavior and (b) were more vigilant about ignoring his inappropriate behaviors. It is unfortunate, from a research point of view, that no empirical data were collected to determine the effects, if any, of the change in staff behavior.

A further potential confounding variable was that of "awareness". Students 1 and 2 in Classroom 2 were aware they were being observed and recorded by classroom staff, (not the researcher) while Students 3 and 4 in Classroom 1 were not. This problem was noted through the staff questionnaire wherein one staff member suggested that student "awareness" contributed to the observed reductions in problem behaviors. Specifically, it was reported that Student 1 began to self-monitor or "catch" himself prior to talking out of turn. For both classrooms, however, the scatter plot assessment was effective in guiding antecedent program changes. Perhaps being "aware" or self-monitoring was responsible for the clearer and more wide spread reductions in problem behaviors for the two students in Classroom 2. Again, no data were collected on this phenomena and it's effect is ultimately an empirical question.

In summary, the limitations described above suggest that caution must be used in the interpretation of the intervention results. Without the benefit of experimental manipulation, it is difficult to state with confidence why the observed changes occurred. The data, as reported, do serve to illustrate and validate the scatter plot *method* of functional assessment. As well, descriptive field study data of this nature remain important for their ability to reveal relationships that can form the foundations for future experimental investigations (Bijou, Peterson, & Ault, 1968; Epling & Pierce, 1986). Further implications of a descriptive functional assessment approach to problem behavior are discussed in the following section.

Implications

The following section elaborates on a number of the implications of using a functional perspective when dealing with problem behavior. Previously, the terms "analysis" and "assessment" were distinguished. Here they are used interchangeably to denote a general functional approach to problem behavior (i.e., an analysis of the relation between problem behavior and antecedent events). Practical, ethical and theoretical implications are introduced and discussed.

Practical Implications. The findings of this study provide additional empirical evidence for antecedent approaches to managing problem behavior (Dunlap et al., 1991; Haring & Kennedy, 1990; Touchette et al., 1985). Support was gathered for the use of a functional assessment technique by teaching staff within a special education classroom. Specifically, in the present study, decisions were based on direct observational data collected by the teaching staff in the classroom setting in which the problem behaviors actually occurred. In general, a functional assessment approach to problem behavior may lead to a change in emphasis when training behavior modifiers. Analysis of antecedent stimuli and setting events would be emphasized rather than exclusive focus on consequent events (Bailey & Pyles, 1989). Data collection methods could also change. Rather than always removing the learner from his or her "natural" context, behavior, as demonstrated by the scatter plot, can be observed *in context* to include environmental correlates (Bailey & Pyles, 1989; Touchette, et al., 1985).

Ethical Implications. The results of the present study provide additional evidence that functionally based, antecedent interventions can be effective, ethical alternatives to more aversive behavior management practices such as punishment (Abramowitz & O'Leary, 1990). Indeed, in the long run, it may be more humane and ethical to analyze the controlling variables before applying an intervention package (Axelrod, 1987; Bailey & Pyles, 1989, LaVigna & Donnellan, 1986). Ultimately, more effective interventions are based on changing the "cause" of problem behavior (i.e., the controlling variables) rather than modifications based on "cookbook" operant procedures (O'Neill et al., 1990). Additionally, knowing the functional relations between the different aspects of the person's environment and occurrences of problem behavior will lead to proactive procedures. In this study, for example, manipulations were based entirely on the classroom schedules or academic routines with no modifications, per se, to programmed consequences for positive or negative behaviors. Thus, the design of activity schedules or curriculum for children with behavior disorders could be guided by functional assessment data according to several environmental dimensions including the effects of various setting events such as crowding, demands, and types of activities (Cipani, 1989; Bailey & Pyles, 1989). Activities could be planned so as to minimize or prevent the occurrence of problem behavior. Finally, the individualized schedules resulting from functional assessment data are ethically more desirable than approaches which do not consider the idiosyncracies in behavior exhibited by different people.

Theoretical Implications. The scatter plot assessment used in this study pointed to the relationship between broad, antecedent variables and problem behaviors. The antecedent variables hypothesized to set the occasion for problem behavior were manipulated in an attempt to produce positive behaviour change. The demonstrated success of this approach to assessment, confirmed previous research (Dunlap et al., 1991; Repp et al., 1988; Touchette, et al., 1985) and provided further evidence that contextual conditions should be considered in the assessment process (Haring & Kennedy, 1990; Wahler & Fox, 1981).

Perhaps the most important overall implication of a functional assessment approach is a reconceptualization of human behavior in applied settings (Bailey & Pyles, 1989). The concept of behavior controlled exclusively by its consequences is no longer justified. Equal applied emphasis must be given to antecedent stimuli. Experimental behavior analysts have, for some time, devoted much effort to understanding stimulus control and related issues (Fields & Verhave, 1987; Stromer & Osborne, 1982). Applied behavior analysts must begin to follow suit. Consequent oriented approaches are not to be entirely abandoned, but should be understood in relation to (a) the immediate antecedent stimuli setting the occasion for the behaviour and (b) the overall context in which the three term contingency (and ultimately intervention) is operating.

An expansion, of sorts, is required for applied analysis. In order to lay claim to the title "analyst" -- applied researchers need to rethink their approaches to intervention. It is imperative that there be *analysis* prior to intervention if we desire truly effective behavior change (Epling & Pierce, 1983; Gardner & Cole, 1983; Singh et al., 1988; Luiselli, 1991). In addition, preventative and long term applications need be sensitive to both the discrete antecedent-behavior-consequence relation and the broader contextual conditions. A number of researchers have recently reminded us of this responsibility. For example, Wahler and

Dumas (1987) pointed out the relationship between a mother's negative extrafamilial contact and subsequent high rate of aversive interactions with her children. Haring and Kennedy (1991) found that some operant interventions (e.g., DRO and time out) were dependent on the instructional context in which they were applied.

Broadly-based, ecological setting events must somehow be brought within the behavior analytic fold, both epistemologically and methodologically. Unfortunately, few applied analytical endeavours can be located investigating the theoretical implications of contextualism (Baer et al., 1987) or establishing operations (Michael, 1982; but see Vollmer & Iwata, 1991 for a recent attempt). Perhaps our applied framework is in need of revision (or stated more positively, perhaps it is currently in a state of revision). Our present technology, whatever the state of the art, still tends to rely on the use of relatively simple contingency management procedures applied to individuals rather than their environments.

Future Research

The following are provided as considerations for future research:

1) Given that the schedule change interventions were fairly broad, it is not clear what the necessary or sufficient conditions were for the observed effects. Future research using an experimental design methodology is necessary for more discrete analysis and fine grained interpretations.

2) While it was suggested that antecedent changes would remove the stimuli setting the occasion for problem behavior and, at the same time, allow other stimuli to set the occasion for positive behavior, no data were collected to evaluate this. Future research should collect data to determine if, in fact, other positive desirable behaviors replace undesirable, negative behaviors.

3) Future research may also consider the extent to which more than one behavior per individual can be "tracked" over time using the scatter plot (e.g., a mutually exclusive desirable and undesirable behavior).

4) Given that behavior change does not occur in a vacuum, along with student behavior change is teacher behavior change. Assessment data could be collected across teaching staff to evaluate the effects of intervention on their behavior.

5) Future research may consider more formal analysis of the qualitative aspects of the student's problem behavior (e.g., characteristics of the inappropriate vocalizations).

6) Future research may wish to capture events occurring in other contexts that may be affecting problem behavior. Several methods are available to broaden the initial scope of assessment to include more than the classroom setting (e.g., use of a video camera to record more complex interactions between staff, students, and classroom environment, or using home-school communication books to see if any covariations exist between behavior at home and school -- a post hoc document analysis).

7) It was reported by staff that Student 1 began to "self-monitor" his target behavior. Future research may wish to address this issue by using an alternating treatment design to investigate the scatter plot, staff monitoring, and student monitoring of target behavior.

8) The present research relied on its own decision-making model to develop hypotheses. However, several other researcher have also suggested similar models. Future research could select and validate a method to test hypotheses in other applied settings.

Concluding Statement

In summary, the functional assessment and intervention in this study addressed environmental correlates of problem behavior. It is not suggested that all potential controlling variables were identified by the scatter plot. Furthermore, the potential controlling variables were likely different across different contexts (Haring & Kennedy, 1990). Perhaps to ensure treatment gains and to improve behavior, continuous assessment may be warranted across different stimuli, settings, and reinforcers. The results of the present study, however, do add to the developing body of research investigating curricular influences on the occurrence of problem behavior. Research conducted by Dunlap and colleagues (1991) similarly identified curricular revisions as an intervention (or independent variable) for severe problem behavior. While the present study's dependent variables could not be characterized as severe (e.g., self-injurious) they were, nevertheless, considered highly problematic by the teaching staff involved. By assessing a broader, non-specific class of problem behaviors with the scatter plot, additional support for its use as a general assessment tool rather than an instrument reserved for specialists has been gathered. In keeping with the recent investigations into curricular change as an independent variable, the present study based program changes entirely on the schedule or content of the classroom routines with no modifications, per se, to programmed consequences for positive or negative behaviour. This antecedent approach relied on positive, proactive procedures rather than reactive, and sometimes restrictive contingency management procedures. In conclusion, this study provides additional empirical evidence that interventions based on functional assessment data can lead to individualized programming with positive results.

REFERENCES

Abramowitz, A. J., & O'Leary, S. G. (1990). Effectiveness of delayed punishment in an applied setting. Behavior Therapy, 21, 231-239.

Alberto, P. E., & Troutman, A. C. (1982). Applied behavior analysis for teachers: Influencing student performance. Toronto ON: Charles E. Merrill.

Alessi, G. (1988). Direct observation methods for emotional behavior problems. In E. S. Shapiro & T. R. Kratochwill (Eds.), Behavioral assessment in schools: Conceptual foundations and practical applications (pp. 14-75). New York: The Guilford Press.

Algozzine, B., Morsink, C. V., & Algozzine, K. M. (1988). What's happening in self-contained special education classrooms? Exceptional Children, 55, 259-265.

Axelrod, S. (1987). Functional and structural analyses of behavior: Approches leading to reduced use of punishment procedures? Research in Developmental Disabilities, 8, 165-178.

Baer, D. M., Wolf, M. M., & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1, 91-97.

Baer, D. M., Wolf, M. M., & Risley, T. R. (1987). Some still-current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 20, 313-327.

Bailey, J. S., & Pyles, D. A. M. (1989). Behavioral diagnostics. In E. Cipani (Ed.), The Treatment of Severe Behavior Disorders:Behavior analysis approaches (pp. 85-107). Washington, D.C.: American Association on Mental Retardation.

Barrish, H. H., Saunders, M., & Wolf, M. M. (1969). Good behavior game: Effects of individual contingencies for group consequences on disruptive behavior in a classroom. Journal of Applied Behavior Analysis, 2, 119-124.

Bijou S. W. (1970). What psychology has to offer education - now. Journal of Applied Behavior Analyis, 3, 65-71.

Bijou, S. W., & Baer, D. M. (1961). Child development I: A systematic and empirical theory. Englewood Cliffs, NJ: Prentice-Hall.

Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. Journal of Applied Behavior Anlaysis, 1, 175-191.

Bilan, A., Glasgow, R. E., & Singer, G. (1990). The need for a science of larger social units: A contextual approach. Behavior Therapy, 21, 195-215.

Breen, C. G., & Haring, T. G. (1991). Effects of contextual competance on social initiations. Journal of Applied Behavior Analysis, 24, 337-347.

Brown, F. (1991). Creative daily scheduling: A nonintrusive approach to challenging behaviors in community residences. The Journal of the Association for Persons with Severe Handicaps, 16, 75-84.

Carr, E. G. (1977). The motivation of self-injurious behavior: A review of some hypotheses. Psychological Bulletin, 84, 800-816.

Cipani, E. (1989). The treatment of severe behavior disorders: Behavior analysis approches. Washington, D.C.: American Association on Mental Retardation.

Cipani, E. (1981). Modifying food spillage behavior in an institutionalized retarded client. Journal of Behavior Therapy and Experimental Psychiatry, 12, 261-265.

Cullenan, D., Epstein, M. H., & Lloyd, J. W. (1991). Evaluation of conceptual models of behavior disorders. Behavioral Disorders, 16, 148-157.

Danforth, J. S., & Drabman, R. S. (1989). Aggressive and disruptive behavior. In E. Cipani (Ed.), The treatment of severe behavior disorders:Behavior analysis approaches (pp. 111-128). Washington, D.C.: American Association on Mental Retardation.

Day, R. M., Schussler, N. G., Larson, S. E., & Johnson, W. L. (1988). A functionally based approach to the treatment of self-injurious behavior. Behavior Modification, 12, 565-589.

Deitz, S. M. (1978). Current status of applied behavior analysis: Science vs. technology. American Psychologist, 33, 805-814.

Donnellan, A. M. (1980, November). An educational perspective of autism: Implications for curricular development and personnel development. In B. Wilcox & A. Thompson (Eds.), Critical issues in educating autistic children and youth. Washington, DC: U.S. Dept. of Education, Office of Special Education.

Donnellan, A. M., Mirenda, P. L., Mesaros, R. A., & Fassbender, L. L. (1984). Analyzing the communicative functions of aberrant behavior. The Journal of the Association for Persons with Severe Handicaps, 9, 201-212.

Donnellan, A. M., & LaVigna, G. W. (1990). Myths about punishment. In A. C. Repp & N.N. Singh (Eds.), Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilities (pp. 33-59). Sycamore, IL: Sycamore Publishing Co.

Dumas, J. E. (1989). Let's not forget the context in behavioral assessement. Behavioral Assessment, 11, 231-247.

Dumas, J. E., & Wahler, R. G. (1983). Predictors of treatment outcome in parent training: Mother insularity and socioeconomic disadvantage. Behavioral Assessment, 5, 301-313.

Dunlap, G., & Dunlap, L. K., Clarke, S., & Robbins, F. R. (1991). Functional assessment, curricular revision, and severe behavior problems. Journal of Applied Behavior Analysis, 24, 387-397.

Durand, V. M, & Carr, E. G. (1987). Social influences on "self-stimuluatory" behavior: Analysis and treatment application. Journal of Applied Behavior Analysis, 20, 119-132.

Dyer, K., Dunlap, G., & Winterling, V. (1990). Effects of choice making on the serious problem behaviors of students with severe handicaps. Journal of Applied Behavior Analysis, 23, 515-524.

Epling, W. F., & Pierce, W. D. (1983). Applied behavior analysis: New directions from the laboratory. The Behavior Analyst, 6, 27-37.

Epling W. F., & Pierce, W. D. (1986). The basic importance of applied behavior analysis. The Behavior Analyst, 9, 89-99.

Ferster, C. W., & Skinner, B. F. (1957). Schedules of reinforcement. New York: Appleton-Century-Crofts.

Fields, L., & Verhave, T. (1987). The structure of equivalences classes. Journal of the Experimental Analysis of Behavior, 48, 317-332.

Gardner, W. I., & Cole, C. L. (1983). Selecting intervention procedures: What happened to behavioral assessment? In O. C. Karan, & W. I. Gardner (Eds.), Habilitation practices with the developmentally disabled with present behavioral and emotional disorders (pp. 91-120). Madison, WI: University of Wisconsin.

Gaylord-Ross, R. (1980). A decision model for the treatment of aberrant behavior in applied settings. In W. Sailor, B. Wilcox, L. Brown (Eds.), Methods of insruction for severely handicapped students (pp. 135-158). Baltimore: Paul N. Brooks.

Gaylord-Ross, R.J., Haring, T. G., Breen, C., Pitts-Conway, V. (1984). The training and generalization of social interaction skills with autistic children. Journal of Applied Behavior Analysis, 17, 229-247.

Glynn, T. (1982). Antecedent control of behaviour in educational contexts. Educational Psychology, 2, 1982.

Hake, D. (1982). The basic-applied continuum and the possible evolution of human operant social and verbal research. The Behavior Analyst, 5, 21-29.

Haring, T. G., & Kennedy, C. H. (1990). Contextual control of problem behavior in students with severe disabilities. Journal of Applied Behavior Analysis, 23, 235-243.

Haynes, S. H. (1989). Behavioral assessment of adult disorders. In G. Goldstein & M. Hersen (Eds.), Handbook of psychological assessment (pp. 369-401). Elmsford, NY: Pergamon Press.

Heward, W. L., Heron, T. E., Hill, D. S., & Trap-Porter, J. (Eds.). (1984). Focus on behavior analysis in education. Toronto ON: Charles E. Merrill Publishing.

Horner, R. D. (1980). The effects of an environmental enrichment program on the behavior of institutionalized profoundly retarded children. Journal of Applied Behavior Analysis, 13, 473-491.

Kantor, J. R. (1959). Interbehavioral psychology. Granville, OH: Principia Press.

Kazdin, A. E. (1981). Drawing valid inferences from case studies. Journal of Consulting and Clinical Psychology, 49, 183-192.

Kazdin, A. E. (1982). The token economy: A decade later. Journal of Applied Behavior Analysis, 15, 431-445.

Kazdin, A. E. (1989). Behavior modification in applied settings. Pacific Grove, CA: Brooks/Cole Publishing Co.

Kazdin, A. E., & Bootzin R. R. (1972). The token economy: An evaluative review. Journal of Applied Behavior Analysis, 5, 343-372.

Kirby, K. C., Bickel, W. K., & Holborn, S. W. (1983). Toward an explicit science of generalization: A stimulus control interpretation. Paper presented at the annual meeting of the Association for Behavior Analysis, Milwaukee, WI.

Kratochwill, T. R., & Shaprio, E. S. (1988). Introduction: Conceptual foundations of behavioral assessment in schools. In E. S. Shapiro & T. R. Kratochwill (Eds.), Behavioral assessment in schools: Conceptual foundations and practical application (pp. 1 - 13). New York: The Guilford Press.

LaVigna, G. W., & Donnellan, A. M. (1986). Alternatives to punishment: Solving behavior problems with non-aversive strategies. New York, NY: Irvington Publishers, Inc.

LaVigna, G. W., Willis, T. J., & Donnellan A. M. (1989). The role of positive programming in behavioral treatment. In E. Cipani (Ed.), The Treatment of Severe Behavior Disorders:Behavior analysis approaches (pp. 59-84). Washington, DC: American Assoication on Mental Retardation.

Leigland, S. (1984). On "setting events" and related concepts. The Behavior Analyst, 7, 41-45.

Lennox, D. B., & Miltenberger, R. G. (1989). Conducting a functional assessment of problem behavior in applied settings. Journal of the Association for Persons with Severe Handicaps, 14, 304-311.

Lentz, F. E., & Shapiro, E. S. (1986). Functional assessment of the academic environment. School Psychology Review, 15, 346-357.

Levis, D. J. (1982). Experimental and theoretical foundations of behavior modification. In A. S. Bellack, M. Hersen, & A. E. Kazdin (Eds.), International handbook of behavior modification and therapy (pp. 33-55). New York: Plenum Press.

Luiselli, J. K. (1991). Assessment derived treatment of children's disruptive behavior disorders. Behavior Modification, 15, 294-309.

Luiselli, J. K. (1990). Recent developments in nonaversive treatment: A review of rationale, methods, and recommendation. In A. C. Repp & N. N. Singh (Eds.), Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilties (pp. 73-86). Sycamore, IL: Sycamore Publishing Co.

Martin, G. L. & Osborne, J. G. (Eds.). (1980). Helping in the community: Behavioral applications. New York: Plenum.

Martin, G., & Pear, J. J. (1986). Behavior modification: What it is and how to do it. Toronto, Canada: Prentice-Hall.

McNaughton, S. (1980). Structuring settings for learning academic skills: Applications to oral reading. Behaviour Therapy in Australia. Proceedings of the Third Australian Conference on Behavior Modification (pp. 306-315). Melbourne.

Merrell, K. W. (1989). Validity issues in direct behavioral observation: Applications for behavioral assessment in the classroom. Canadian Journal of School Psychology, 5, 57-62.

Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. Journal of the Experimental Analysis of Behavior, 37, 145-155.

Morris, E. K. (1988). Contextualism: The world view of behavior analysis. Journal of Experimental Child Psychology, 46, 289-323.

O'Leary, K. D., & Drabman, R. (1971). Token reinforcement programs in the classroom: A review. Psychological Bulletin, 75, 379-398.

O'Neil, R. E., Horner, R. H., Albin, R. W., Storey, K. & Sprague, J. R. (1990). Functional analysis of problem behavior: A practical assessment guide. Sycamore, IL.: Sycamore Publishing Co.

Reiher, T. C. (1992). Identified deficits and their congruence to the IEP for behaviorally disordered students. Behavior Disorders, 17, 167-177.

Repp, A. C., Felce, D., & Barton, L. E., (1988). Basing the treatment of stereotypic and self-injurious behaviors on hypotheses of their causes. Journal of Applied Behavior Analysis, 21, 281-289.

Repp, A. C., & Singh, N. N. (Eds.).(1990). Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilities. Sycamore, IL: Sycamore Publishing Co.

Rhode, G., Morgan, D. P., & Young, K. R. (1983). Generalization and maintenance of treatment gains of behaviorally handicapped students from resource rooms to regular classroom using self-evalluation procedures. Journal of Applied Behavior Analysis, 16, 171-188.

Saigh, P. A., & Umar, A. M. (1983). The effects of a good behavior game on the disruptive behavior of Sudanese school students. Journal of Applied Behavior Analysis, 16, 339-344.

Shaprio, E. S., & Kratochwill, T. R. (Eds.). (1988). Behavioral assessment in schools: Conceptual foundations and practical applications. New York: The Guilford Press.

Singh, N. N., Deitz, D. E. D., Epstein, M. H., & Singh, J. (1991). Social behavior of students who are seriously emotionally disturbed: A quantitative analysis of intervention studies. Behavior Modification, 15, 74-94.

Skinner, B. F. (1953). Science and human behavior. New York: Macmillan.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. Journal of Applied Behavior Analysis, 10, 349-367.

Stromer, R. & Osborne, J. G. (1982). Control of adolescents' arbitrary matching -to - sample relations. Journal of the Experimental Analysis of Behavior, 37, 329-348.

Tarnowski, K. J., Rasnake, L. K., Mulick, J. A., & Kelly, P. A. (1989). Acceptability of behavioral interventions for self-injurious behavior. American Journal on Mental Retardation, 93, 575-580.

Tawny, J. W., & Gast, D. L. (1984). Single subject research in special education. Toronto, ON: Charles E. Merrill Publishing Co.

Touchette, P. E., MacDonald, R. F., & Langer, S. N. (1985). A scatter plot for identifying stimulus control of problem behavior. Journal of Applied Behavior Analysis, 18, 343-351.

Van Houten, R., Nau, P. A., MacKenzie-Keating, S. E., Sameoto, D., & Colavecchia, B. (1982). An analysis of some variables influencing the effectiveness of reprimands. Journal of Applied Behavior Analysis, 15, 65-83.

Volmer, T. R., & Iwata, B. A. (1991). Establishing operation and reinforcement effects. Journal of Applied Behavior Analysis, 24, 279-291.

Weeks, M., & Gaylord-Ross, R. (1981). Task difficulty and aberrant behavior in severely handicapped students. Journal of Applied Behavior Analysis, 14, 449-463.

Weiss, S. M., Herd, J. A., & Fox, E. H. (Eds.). (1980). Perspective on behavioral medicine. New York: Academic Press.

Wahler, R. G., & Dumas, J. E. (1987). Stimulus class determinants of mother-child coercive interchanges in multidistressed families: Assessment and intervention. In J. D. Buchard & S. N. Buchard (Eds.), Prevention of delinquency behavior (pp. 190-219). Sage Publications: Newbury Park.

Wahler, R. G., & Fox, J. J. (1981). Setting events in applied behavior anlysis: Toward conceptual and methodological expansion. Journal of Applied Behavior Analysis, 14, 327-338.

Wheldall, K. (Ed.). (1987) The behaviourist in the classroom. Boston, Mass.: Allen & Unwin.

Wheldall, K. (1981). Concluding comments: 'A before c' or the use of behaviour ecology in classroom management. In K. Wheldal (Ed.), The behaviourist in the classroom. Aspects of applied behavioural analysis in british educational contexts Educational Review Offset Publications, No. 2: Unversity of Birmingham.

White, M. A. (1975). Natural rates of teacher approval and disapproval in the classroom. Journal of Applied Behavior Analysis, 8, 367-372.

Williams, B. F., Williams, R. L., & McLaughin, T. F. (1989). The use of token economies with individuals who have developmental disabilities. In E. Cipani (Ed.), The treatment of severe behavior disorders: Behavior analysis approaches (pp 3-18). Washington, D.C.: American Association on Mental Retardation.

Winett, R. A., & Winkler, R. C. (1972). Current behavior modification in the classroom: Be still, be quiet, be docile. Journal of Applied Behavior Analysis, 5, 499-505.

Winterling, V., Dunlap, G., & O'Neill, R. E. (1987). The influence of task variation on the aberrant behaviors of autistic students. Education and Treatment of Children, 10, 105-119.

Ysseldike, J. E. (1983). Current practices in making psychoeducational decisions about learning disabled students. Journal of Learning Disablilities, 16, 226-233.

Appendix 1

Scatter Plot Grid

Student ☐

APPENDIX 1
SCATTER PLOT

Successive School Days

Time	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F	M	T	W	T	F
8:30 9:00																				
9:00 9:30																				
9:30 10:15																				
10:15 10:30	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
10:30 11:00																				
11:00 11:30																				
11:30 12:00																				
12:00 12:30	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
12:30 1:00																				
1:00 1:30																				
1:30 2:00																				
2:00 2:30																				

Behavior ☐

☐ ____________

● ____________

■ ____________

Appendix 2

Classroom 1 Daily Schedule

Appendix 2

Classroom 1

Daily Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
Morning Routines/ Relaxation	Morning Routines/ Relaxation	Morning Routines/ Relaxation	Morning Routines/ Relaxation	M. R. Rel.
Language Arts	L.A.	L.A.	L.A.	L.A.
Mechanics	Vocabulary	Cursive Writing	Vocabulary	Creative Writing
		RECESS		
MATH	MATH	MATH	MATH	MATH
Spelling	Computers	Computers	Library	Problem Solving
Health	Pro-Social Skills	Health	Spelling	Spelling
		LUNCH		
Social	Projects	Projects	Projects	?
Science	Projects	Social	Projects	Special Activity

Appendix 3

Classroom 2 Daily Schedule

Appendix 3

Classroom 2

Daily Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
Line-up/ Lockers	Line-up/ Lockers	Line-up/ Lockers	Line-up/ Lockers	Line-up/ Lockers
Prayer/Jobs	Prayer/Jobs	Prayer/Jobs	Prayer/Jobs	Prayer/Jobs
DEAR*	DEAR	DEAR	DEAR	DEAR
Language Arts	Math	L.A.	Math	L.A.
		RECESS		
Line-up/ Snack	Line-up/ Snack	Line-up/ Snack	Line-up/ Snack	Line-up/ Snack
MATH	L.A.	MATH	L.A.	Printing
Spelling	Computers	Computers	Library	Problem Solving
Computers Computers	Current Events	Computers	Current Events	
		LUNCH		
Line-up	Line-up	Line-up	Line-up	Line-up
Social Skills	Life Skills	Social Skills	Life Skills	S. S.
ART	Phys. Ed.	Story Time/ Library	Phys. Ed./ Computers	Art/ Religion
Messages/ Line-up	Messages/ Line-up	Message/ Line-up	Messages Line-up	Messages/ Line-up

* DEAR - Drop Everything And Read.

APPENDIX 4

Data Collection Sheets for Class 1 and 2

DATA COLLECTION SHEET CLASS 1

Student	Date	Behavior

	Days					Comments
Time	M	T	W	T	F	
8:30 9:00						
9:00 9:30						
9:30 10:15						
10:15 10:30	▨	▨	▨	▨	▨	
10:30 11:00						
11:00 11:30						
11:30 12:00						
12:00 12:30	▨	▨	▨	▨	▨	
12:45 1:00						
1:00 1:30						
1:30 2:00						
2:00 2:30						

DATA COLLECTION SHEET CLASS 2

Student

Date

Behavior

	Days					Comments
Time	M	T	W	T	F	
8:30 9:00						Line Up 8:30 - 8:40
9:00 9:30						
9:30 10:05						
10:20 11:00						Line Up 10:20 -10:30
11:00 11:40						
12:30 1:00						Line Up12:30 - 12:40
1:00 1:30						
1:30 2:00						
2:00 2:30						Line Up 2:20 - 2:30

APPENDIX 5

Scatter Plot Questionnaire Results

Appendix 5

Scatter Plot Questionnaire

1.Do you feel that recording student behavior affected,

a) your teaching behavior? If so, how?

I became more aware of the time which the behavior occurred

Yes, it made me more focussed on noticing certain behaviors and altering classroom procedures to change behavior.

Yes, I became more aware of the number of times the behavior occurred.

Has made me more consistant when I don't have apporpriate behavior from the student.

b) your student's behavior? If so, how?

Only when they noticed me recording the behavior. Then it usually decreased their behavior.

Somewhat, in that we reduced the student's behavior even though the student did not know they were being monitored.

The student involved became more aware of the behavior and started to self-monitor (catching himself)

Not much.

2.Do you feel that the presence of the researcher affected the student's behavior? If so, how?

Not at all

Not at all. Mr. Symons became part of our class. My students showed interest in Mr. Symons and his work. Mr. Symons easy and friendly manner made him fit right in.

No. The researcher was unobtrusive.

Not much at all.

3.Do you feel the procedure (i.e., counting occurrences of a specific behavior) was: [circle any that apply]

a) relatively easy √√√√
b) relatively difficult
c) time consuming
d) confusing

Comments - ***No problem at all.***

Once I became familiar with what specific behaviors I was recording, the procedure was easy and not time consuming.

Sometimes neglecting to record due to newness. After recording for a while it became more spontaneous.

4.Do you feel that the behavior of the student's involved was changed in any significant ways? (e.g., easy or more difficult to manage, etc.)

Yes, easier to manage.

Yes, with one of our students, his target behavior decreased somewhat when we introduced a new classroom routine.

The student's behavior became more manageable due to two factors - student was put on medication - Ritalin - and student began to self-monitor behavior.

Yes, student was under control at certain times when tasks were implemented.

5. Do you feel the scatter plot graph was helpful in any way with program planning for the students involved?

If yes, how?

Yes, I was able to plan for the time in which the behavior occured

We noticed a trend in the scatter plot graph which enabled us to focus on the specific cause of the behavior at that point, and thus try to change the behavior.

Entering the classroom procedures were changed - students were sent in one at a time - this cut down on conflict between students, e.g., arguing, hitting.

Made me aware of certain times that student had behaviors that could be improved.

If no, how might it be changed or improved?

6. Would you use this or a slightly modified procedure to assist with future program planning?

Yes.

This procedure would be very interesting as it enables the teacher to see trends. Unfortunately, it would be very time consuming to monitor all students and plot their behavior.

Yes - the procedure is very visual and I became more aware of the times of the behavior occurring, the envrionment surrounding the behavior

Yes, for awareness purposes.

7. Please comment further on the above or other aspects of this research project that you feel are important.

The researcher was very helpful in explaining the graph. His suggestions were great, they improved my classroom manageability.

I would like to thank Mr. Symons for being so thourough, friendly, and helpful. He made the whole procedure very easy & interesting.

The researcher was very accomodating to the different demands of the classroom. The project was helpful in as much as it made me more aware of occurences of the specific behaviors, ways to improve recording procedures, very visual.

Made me more aware of the conduct of some of the students and distracting behaviors.

Appendix 6

Consent Form

Appendix 6

Consent Form

Please read this form carefully. This form outlines the purpose and methods involved in this research study. If you wish your son/daughter to participate in this research, please sign below and return this form in the envelope provided. **You may withdraw consent for your child's participation at any time.**

Purpose of Study

The purpose of this research is to evaluate the effectiveness of a graphing method to assist the classroom teacher in planning timetable activities for students.

Procedures to be Followed

Observational data will be collected be th teacher and//or aide throughout the school day. As the data is collected, it will be displiayed on a graph called a scatter plot. It is hoped that the patterns tthat emerge on the graph can assist the teacher in making timetable/activity changes which better reflect your child's learning preference. In essence, an "ideal" fit is being sought between the student and the school environment.

Potential Benefits of the Research

It is hoped that the research will help your child by recognizing his or her unique characteristics in relation to the classroom envrionment. Your child's problem behavior will be viewed as a form of communication which will direct the development of a personalized academic schedule. The results of this research will be of interest to teachers, psychologists, counsellors, and parents of children who exhibit severe and challenging behavior. It will also validate one method for gaining information about how each individual student is affected by his or her educational environment.

Period of Time Required

The research will require approximately 8 continuous weeks beginning in the 1992 school year (i.e., January and Feburary) with monthly probes conducted until the end of June, 1992.

Rights of the Participants

As the parent or legal guardian, I understand that:

1. I have the right to withdraw consent for my child's particpation at any time.
2. I understand that my child's name will not appear on any information that is published or presented.
3. I understand that I can ask questions of the primary researcher involved in this study.

This person is:

Mr. Frank Symons	University of Alberta	435-7028

By signing this form, I consent to the participation of my son/daughter in the research outlined above. I have been informed of the purpose and understand the procedures involved in this study.

Signature of Parent/Guardian ________________ Date ________

Witness ________________ Date ________